

Pensieve header: Solving the WKO equations using free-Lie μ -calculus technology.

Solving the Equations

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SetDirectory["C:\\drorbn\\AcademicPensieve\\2013-04"];
<< FreeLie.m
$SeriesShowDegree = 3; $SeriesCompareDegree = 5;
<< muCalculus.m

μCoefficients[expr_] := Flatten[Last[Reap[Collect[expr, _LW | _CW, Sow[#] &]]]];
μCoefficients[l_List] := μCoefficients /@ l;

α = MakeLieSeries[{"1", "2"}, αs];
β = MakeLieSeries[{"1", "2"}, βs];
γ = MakeCWSeries[{"1", "2"}, γs];
V = M[{1 → α, 2 → β}, γ];
κs[d_, 1] := If[OddQ[d], 0, κs[d]];
κ = MakeCWSeries[{"1"}, κs];
Unprotect[C]; C = M[{1 → MakeLieSeries[0]}, κ];

HardR4[d_, V_] :=
  Module[{lhs = R+[2, 3] ** R+[1, 3] ** V, rhs = V ** (R+[1, 3] // dΔ[1, 1, 2])},
    {lhs[1]@d - rhs[1]@d, lhs[2]@d - rhs[2]@d,
     lhs[3]@d - rhs[3]@d, lhs[W]@d - rhs[W]@d}
  ];

TwistEq[d_, V_] :=
  Module[{lhs = V ** θ[1, 2], rhs = R+[1, 2] ** (V // dσ[{1, 2} → {2, 1}])},
    {lhs[1]@d - rhs[1]@d, lhs[2]@d - rhs[2]@d, lhs[W]@d - rhs[W]@d}
  ];

UnitarityEq[d_, V_] :=
  Module[{lhs = V ** (V // dA[1] // dA[2]), rhs = dε[1] ∪ dε[2]},
    {lhs[1]@d - rhs[1]@d, lhs[2]@d - rhs[2]@d, lhs[W]@d - rhs[W]@d}
  ];

CapEq[d_, V_, C_] :=
  Module[{lhs = V ** (C // dΔ[1, 1, 2]) // dc[1] // dc[2], rhs = C ∪ (C // dσ[1, 2])},
    {lhs[W]@d - rhs[W]@d}
  ];

VerticalFlipEq[d_, V_] :=
  Module[{lhs = V ** (V // dS[1] // dS[2]), rhs = R+[1, 2]},
    {lhs[1]@d - rhs[1]@d, lhs[2]@d - rhs[2]@d, lhs[W]@d - rhs[W]@d}
  ];

```

{V, C}

$$\begin{aligned} & \left\{ M \left[\left\{ 1 \rightarrow \text{LS} \left[\overline{1} \alpha s[1, 1] + \overline{2} \alpha s[1, 2], \overline{12} \alpha s[2, 1], \overline{112} \alpha s[3, 1] + \overline{122} \alpha s[3, 2] \right], \right. \right. \\ & \quad \left. \left. 2 \rightarrow \text{LS} \left[\overline{1} \beta s[1, 1] + \overline{2} \beta s[1, 2], \overline{12} \beta s[2, 1], \overline{112} \beta s[3, 1] + \overline{122} \beta s[3, 2] \right] \right\}, \right. \\ & \quad \left. \text{CWS} \left[\overline{1} \gamma s[1, 1] + \overline{2} \gamma s[1, 2], \overline{11} \gamma s[2, 1] + \overline{12} \gamma s[2, 2] + \overline{22} \gamma s[2, 3], \right. \right. \\ & \quad \left. \left. \overline{111} \gamma s[3, 1] + \overline{112} \gamma s[3, 2] + \overline{122} \gamma s[3, 3] + \overline{222} \gamma s[3, 4] \right] \right\}, \\ & \quad \left. M \left[\left\{ 1 \rightarrow \text{LS} [0, 0, 0] \right\}, \text{CWS} [0, \overline{11} \kappa s[2], 0] \right] \right\} \end{aligned}$$

HardR4[2, V]

$$\left\{ 0, 0, -\frac{\langle 12 \rangle}{2} - \langle 12 \rangle \alpha s[1, 2] + \langle 12 \rangle \beta s[1, 1], 0 \right\}$$

HardR4[2, V] // μCoefficients

$$\left\{ \{0\}, \{0\}, \left\{ -\frac{1}{2} - \alpha s[1, 2] + \beta s[1, 1] \right\}, \{0\} \right\}$$

TwistEq[1, V] // μCoefficients

$$\begin{aligned} & \left\{ \left\{ \frac{1}{2} + \alpha s[1, 2] - \beta s[1, 1], \alpha s[1, 1] - \beta s[1, 2] \right\}, \right. \\ & \quad \left\{ -\frac{1}{2} - \alpha s[1, 2] + \beta s[1, 1], -\alpha s[1, 1] + \beta s[1, 2] \right\}, \\ & \quad \left. \left\{ \gamma s[1, 1] - \gamma s[1, 2], -\gamma s[1, 1] + \gamma s[1, 2] \right\} \right\} \end{aligned}$$

CapEq[1, V, C] // μCoefficients

$$\left\{ \{-\alpha s[1, 1] + \gamma s[1, 1], -\beta s[1, 2] + \gamma s[1, 2]\} \right\}$$

VerticalFlipEq[1, V] // μCoefficients

$$\left\{ \{2 \alpha s[1, 1], 2 \alpha s[1, 2]\}, \{-1 + 2 \beta s[1, 1], 2 \beta s[1, 2]\}, \{\alpha s[1, 1], \beta s[1, 2]\} \right\}$$

**soll = Solve[(# == 0) & /@ Union[μCoefficients[
 HardR4[2, V], TwistEq[1, V], CapEq[1, V, C], VerticalFlipEq[1, V]
]]]**

$$\left\{ \left\{ \alpha s[1, 1] \rightarrow 0, \alpha s[1, 2] \rightarrow 0, \beta s[1, 1] \rightarrow \frac{1}{2}, \beta s[1, 2] \rightarrow 0, \gamma s[1, 1] \rightarrow 0, \gamma s[1, 2] \rightarrow 0 \right\} \right\}$$

soll /. Rule → Set; {V, C}

$$\begin{aligned} & \left\{ M \left[\left\{ 1 \rightarrow \text{LS} \left[0, \overline{12} \alpha s[2, 1], \overline{112} \alpha s[3, 1] + \overline{122} \alpha s[3, 2] \right], \right. \right. \\ & \quad \left. \left. 2 \rightarrow \text{LS} \left[\frac{\overline{1}}{2}, \overline{12} \beta s[2, 1], \overline{112} \beta s[3, 1] + \overline{122} \beta s[3, 2] \right] \right\}, \right. \\ & \quad \left. \text{CWS} \left[0, \overline{11} \gamma s[2, 1] + \overline{12} \gamma s[2, 2] + \overline{22} \gamma s[2, 3], \right. \right. \\ & \quad \left. \left. \overline{111} \gamma s[3, 1] + \overline{112} \gamma s[3, 2] + \overline{122} \gamma s[3, 3] + \overline{222} \gamma s[3, 4] \right] \right\}, \\ & \quad \left. M \left[\left\{ 1 \rightarrow \text{LS} [0, 0, 0] \right\}, \text{CWS} [0, \overline{11} \kappa s[2], 0] \right] \right\} \end{aligned}$$

UnitarityEq[2, V]

$$\{0, 0, \text{CW}[12] \alpha s[2, 1] - \text{CW}[12] \beta s[2, 1] + 2 \text{CW}[11] \gamma s[2, 1] + 2 \text{CW}[12] \gamma s[2, 2] + 2 \text{CW}[22] \gamma s[2, 3]\}$$

HardR4[3, V] // μ Coefficients

$$\{\{0\}, \{0\}, \left\{-\frac{1}{24} - \alpha s[2, 1], \frac{1}{12} + \beta s[2, 1]\right\}, \{0\}\}$$

TwistEq[2, V] // μ Coefficients

$$\left\{\left\{\frac{1}{8} + \alpha s[2, 1] + \beta s[2, 1]\right\}, \left\{\frac{1}{8} + \alpha s[2, 1] + \beta s[2, 1]\right\}, \{\gamma s[2, 1] - \gamma s[2, 3], -\gamma s[2, 1] + \gamma s[2, 3]\}\right\}$$

CapEq[2, V, C] // μ Coefficients

$$\{\{\alpha s[2, 1] - \beta s[2, 1] + \gamma s[2, 2] + 2 \kappa s[2], \gamma s[2, 1], \gamma s[2, 3]\}\}$$

**sol2 = Solve[(# == 0) & /@ Union[μ Coefficients[
 HardR4[3, V], TwistEq[2, V], UnitarityEq[2, V], CapEq[2, V, C]
]]]]**

$$\left\{\left\{\alpha s[2, 1] \rightarrow -\frac{1}{24}, \beta s[2, 1] \rightarrow -\frac{1}{12}, \gamma s[2, 1] \rightarrow 0, \gamma s[2, 2] \rightarrow -\frac{1}{48}, \gamma s[2, 3] \rightarrow 0, \kappa s[2] \rightarrow -\frac{1}{96}\right\}\right\}$$

sol2 /. Rule -> Set; {V, C}

$$\left\{M\left[\left\{1 \rightarrow \text{LS}\left[0, -\frac{\overline{12}}{24}, \overline{112} \alpha s[3, 1] + \overline{122} \alpha s[3, 2]\right], 2 \rightarrow \text{LS}\left[\frac{\overline{1}}{2}, -\frac{\overline{12}}{12}, \overline{112} \beta s[3, 1] + \overline{122} \beta s[3, 2]\right]\right\}, \text{CWS}\left[0, -\frac{\overline{12}}{48}, \overline{111} \gamma s[3, 1] + \overline{112} \gamma s[3, 2] + \overline{122} \gamma s[3, 3] + \overline{222} \gamma s[3, 4]\right]\right], M\left[\left\{1 \rightarrow \text{LS}[0, 0, 0]\right\}, \text{CWS}\left[0, -\frac{\overline{11}}{96}, 0\right]\right]\right\}$$

UnitarityEq[3, V] // μ Coefficients

$$\{\{0\}, \{0\}, \{\alpha s[3, 1] - \beta s[3, 1] + 2 \gamma s[3, 2], -\alpha s[3, 2] + \beta s[3, 2] + 2 \gamma s[3, 3], 2 \gamma s[3, 1], 2 \gamma s[3, 4]\}\}$$

HardR4[4, V] // μ Coefficients

$$\{\{0\}, \{0\}, \{-\alpha s[3, 1], -\alpha s[3, 2] + \beta s[3, 1], \beta s[3, 2]\}, \{0\}\}$$

TwistEq[3, V] // μ Coefficients

$$\left\{\{\alpha s[3, 1] - \beta s[3, 2], \alpha s[3, 2] - \beta s[3, 1]\}, \{-\alpha s[3, 1] + \beta s[3, 2], -\alpha s[3, 2] + \beta s[3, 1]\}, \{\gamma s[3, 1] - \gamma s[3, 4], -\gamma s[3, 1] + \gamma s[3, 4], \gamma s[3, 2] - \gamma s[3, 3], -\gamma s[3, 2] + \gamma s[3, 3]\}\right\}$$

CapEq[3, V, C] // μ Coefficients

$$\{\{\alpha s[3, 1] - \beta s[3, 1] + \gamma s[3, 2], -\alpha s[3, 2] + \beta s[3, 2] + \gamma s[3, 3], \gamma s[3, 1], \gamma s[3, 4]\}\}$$

**sol3 = Solve[(# == 0) & /@ Union[μ Coefficients[
 HardR4[4, V], TwistEq[3, V], UnitarityEq[3, V], CapEq[3, V, C]
]]]]**

$$\{\{\alpha s[3, 1] \rightarrow 0, \alpha s[3, 2] \rightarrow 0, \beta s[3, 1] \rightarrow 0, \beta s[3, 2] \rightarrow 0, \gamma s[3, 1] \rightarrow 0, \gamma s[3, 2] \rightarrow 0, \gamma s[3, 3] \rightarrow 0, \gamma s[3, 4] \rightarrow 0\}\}$$

sol3 /. Rule \rightarrow Set; {V, C}

$$\left\{M\left[\left\{1 \rightarrow \text{LS}\left[0, -\frac{\sqrt{12}}{24}, 0\right], 2 \rightarrow \text{LS}\left[\frac{1}{2}, -\frac{\sqrt{12}}{12}, 0\right]\right\}, \text{CWS}\left[0, -\frac{\sqrt{12}}{48}, 0\right]\right], M\left[\left\{1 \rightarrow \text{LS}[0, 0, 0]\right\}, \text{CWS}\left[0, -\frac{\sqrt{11}}{96}, 0\right]\right]\right\}$$

UnitarityEq[4, V] // μ Coefficients

$$\left\{\{0\}, \{0\}, \left\{-\frac{1}{576} + \alpha s[4, 1] - \beta s[4, 1] + 2 \gamma s[4, 2], -\frac{1}{1152} + \alpha s[4, 2] - \beta s[4, 2] + 2 \gamma s[4, 3], -2 \alpha s[4, 2] + 2 \beta s[4, 2] + 2 \gamma s[4, 4], \alpha s[4, 3] - \beta s[4, 3] + 2 \gamma s[4, 5], 2 \gamma s[4, 1], 2 \gamma s[4, 6]\right\}\right\}$$

**sol4 = Solve[(# == 0) & /@ Union[μ Coefficients[
 HardR4[5, V], TwistEq[4, V], UnitarityEq[4, V], CapEq[4, V, C]
]]]]**

$$\left\{\left\{\alpha s[4, 1] \rightarrow \frac{7}{5760}, \beta s[4, 1] \rightarrow \frac{1}{5760}, \alpha s[4, 2] \rightarrow -\frac{7}{5760}, \alpha s[4, 3] \rightarrow \frac{1}{1440}, \beta s[4, 2] \rightarrow -\frac{1}{720}, \beta s[4, 3] \rightarrow \frac{1}{720}, \gamma s[4, 1] \rightarrow 0, \gamma s[4, 2] \rightarrow \frac{1}{2880}, \gamma s[4, 3] \rightarrow \frac{1}{2880}, \gamma s[4, 4] \rightarrow \frac{1}{5760}, \gamma s[4, 5] \rightarrow \frac{1}{2880}, \gamma s[4, 6] \rightarrow 0, \kappa s[4] \rightarrow \frac{1}{11520}\right\}\right\}$$

sol4 /. Rule \rightarrow Set; \$SeriesShowDegree = 4; {V, C}

$$\left\{M\left[\left\{1 \rightarrow \text{LS}\left[0, -\frac{\sqrt{12}}{24}, 0, \frac{\sqrt{71112}}{5760} - \frac{\sqrt{71122}}{5760} + \frac{\sqrt{12222}}{1440}\right], 2 \rightarrow \text{LS}\left[\frac{1}{2}, -\frac{\sqrt{12}}{12}, 0, \frac{\sqrt{1112}}{5760} - \frac{1}{720} \sqrt{1122} + \frac{1}{720} \sqrt{1222}\right]\right\}, \text{CWS}\left[0, -\frac{\sqrt{12}}{48}, 0, \frac{\sqrt{1112}}{2880} + \frac{\sqrt{1122}}{2880} + \frac{\sqrt{1212}}{5760} + \frac{\sqrt{1222}}{2880}\right]\right], M\left[\left\{1 \rightarrow \text{LS}[0, 0, 0, 0]\right\}, \text{CWS}\left[0, -\frac{\sqrt{11}}{96}, 0, \frac{\sqrt{1111}}{11520}\right]\right]\right\}$$

VerticalFlipEq[#, V] & /@ {2, 3, 4}

{0, 0, 0}, {0, 0, 0}, {0, 0, 0}

**sol5 = Solve[(# == 0) & /@ Union[μ Coefficients[{
 HardR4[6, V], TwistEq[5, V], UnitarityEq[5, V], CapEq[5, V, C]
 }]]]**

{ { α s[5, 1] \rightarrow 0, α s[5, 3] \rightarrow 0, β s[5, 1] \rightarrow $-\frac{1}{7680}$, α s[5, 6] \rightarrow 0, α s[5, 2] \rightarrow 0,
 α s[5, 4] \rightarrow 0, β s[5, 2] \rightarrow $\frac{1}{3840}$, α s[5, 5] \rightarrow 0, β s[5, 3] \rightarrow $-\frac{1}{6912}$, β s[5, 4] \rightarrow 0,
 β s[5, 5] \rightarrow 0, β s[5, 6] \rightarrow 0, γ s[5, 1] \rightarrow 0, γ s[5, 2] \rightarrow 0, γ s[5, 3] \rightarrow 0,
 γ s[5, 4] \rightarrow 0, γ s[5, 5] \rightarrow 0, γ s[5, 6] \rightarrow 0, γ s[5, 7] \rightarrow 0, γ s[5, 8] \rightarrow 0 } }

sol5 /. Rule \rightarrow Set; \$SeriesShowDegree = 5; {V, C}

{ M[{ 1 \rightarrow LS [0, $-\frac{\overline{12}}{24}$, 0, $\frac{\overline{71112}}{5760} - \frac{\overline{71122}}{5760} + \frac{\overline{1222}}{1440}$, 0], 2 \rightarrow
 LS [$\frac{\overline{1}}{2}$, $-\frac{\overline{12}}{12}$, 0, $\frac{\overline{1112}}{5760} - \frac{1}{720} \frac{\overline{1122}}{1222} + \frac{1}{720} \frac{\overline{1222}}{12222}$, $-\frac{\overline{11112}}{7680} + \frac{\overline{11122}}{3840} - \frac{\overline{11212}}{6912}$] },
 CWS [0, $-\frac{\overline{12}}{48}$, 0, $\frac{\overline{1112}}{2880} + \frac{\overline{1122}}{2880} + \frac{\overline{1212}}{5760} + \frac{\overline{1222}}{2880}$, 0] },
 M [{ 1 \rightarrow LS [0, 0, 0, 0, 0], CWS [0, $-\frac{\overline{11}}{96}$, 0, $\frac{\overline{1111}}{11520}$, 0] }] }

VerticalFlipEq[5, V]

{0, 0, 0}

```
sol6 = Solve[ (# == 0) & /@ Union[μCoefficients[{
  HardR4[7, V], TwistEq[6, V], UnitarityEq[6, V], CapEq[6, V, C]
}]]]
```

$$\left\{ \left\{ \begin{aligned} \alpha s[6, 1] &\rightarrow -\frac{31}{967680}, \alpha s[6, 3] \rightarrow -\frac{31}{645120}, \beta s[6, 1] \rightarrow -\frac{1}{645120}, \\ \alpha s[6, 9] &\rightarrow -\frac{1}{60480}, \alpha s[6, 2] \rightarrow \frac{31}{483840}, \beta s[6, 2] \rightarrow \frac{23}{483840}, \alpha s[6, 7] \rightarrow \frac{13}{241920}, \\ \alpha s[6, 4] &\rightarrow -\frac{83}{967680}, \beta s[6, 3] \rightarrow -\frac{41}{580608}, \alpha s[6, 8] \rightarrow \frac{101}{1451520}, \\ \alpha s[6, 5] &\rightarrow -\frac{31}{725760}, \alpha s[6, 6] \rightarrow \frac{527}{5806080}, \beta s[6, 4] \rightarrow -\frac{13}{161280}, \beta s[6, 5] \rightarrow -\frac{1}{22680}, \\ \beta s[6, 6] &\rightarrow \frac{71}{483840}, \beta s[6, 7] \rightarrow \frac{1}{15120}, \beta s[6, 8] \rightarrow \frac{1}{12096}, \beta s[6, 9] \rightarrow -\frac{1}{30240}, \\ \gamma s[6, 1] &\rightarrow 0, \gamma s[6, 2] \rightarrow -\frac{1}{120960}, \gamma s[6, 3] \rightarrow -\frac{1}{120960}, \gamma s[6, 4] \rightarrow -\frac{1}{120960}, \\ \gamma s[6, 5] &\rightarrow -\frac{1}{120960}, \gamma s[6, 6] \rightarrow -\frac{1}{241920}, \gamma s[6, 7] \rightarrow -\frac{1}{120960}, \gamma s[6, 8] \rightarrow -\frac{1}{120960}, \\ \gamma s[6, 9] &\rightarrow -\frac{1}{120960}, \gamma s[6, 10] \rightarrow -\frac{1}{362880}, \gamma s[6, 11] \rightarrow -\frac{1}{120960}, \\ \gamma s[6, 12] &\rightarrow -\frac{1}{241920}, \gamma s[6, 13] \rightarrow -\frac{1}{120960}, \gamma s[6, 14] \rightarrow 0, \kappa s[6] \rightarrow -\frac{1}{725760} \end{aligned} \right\} \right\}$$

sol6 /. Rule -> Set; \$SeriesShowDegree = 6; {V, C}

$$\begin{aligned}
 & \left\{ M \left[\left\{ 1 \rightarrow LS \left[0, -\frac{\overline{12}}{24}, 0, \frac{\overline{71112}}{5760} - \frac{\overline{71122}}{5760} + \frac{\overline{1222}}{1440}, \right. \right. \right. \\
 & \quad 0, -\frac{\overline{3111112}}{967680} + \frac{\overline{3111122}}{483840} - \frac{\overline{8311222}}{967680} - \frac{\overline{3111222}}{725760} - \\
 & \quad \left. \left. \left. \frac{\overline{31112212}}{645120} + \frac{\overline{13122222}}{241920} + \frac{\overline{10122222}}{1451520} + \frac{\overline{527122212}}{5806080} - \frac{\overline{1222222}}{60480} \right\} \right], \right. \\
 & \quad 2 \rightarrow LS \left[\frac{\overline{1}}{2}, -\frac{\overline{12}}{12}, 0, \frac{\overline{1112}}{5760} - \frac{1}{720} \frac{\overline{1122}}{1222} + \frac{1}{720} \frac{\overline{1222}}{1222}, -\frac{\overline{11112}}{7680} + \frac{\overline{11122}}{3840} - \frac{\overline{11212}}{6912}, \right. \\
 & \quad -\frac{\overline{11112}}{645120} + \frac{\overline{2311122}}{483840} - \frac{\overline{13112222}}{161280} - \frac{\overline{112122}}{22680} - \\
 & \quad \left. \left. \left. \frac{\overline{41112212}}{580608} + \frac{\overline{112222}}{15120} + \frac{\overline{122222}}{12096} + \frac{\overline{71122212}}{483840} - \frac{\overline{122222}}{30240} \right\} \right], \\
 & \quad CWS \left[0, -\frac{\overline{12}}{48}, 0, \frac{\overline{1112}}{2880} + \frac{\overline{1122}}{2880} + \frac{\overline{1212}}{5760} + \frac{\overline{1222}}{2880}, 0, -\frac{\overline{11112}}{120960} - \frac{\overline{11122}}{120960} - \frac{\overline{11212}}{120960} - \frac{\overline{11222}}{120960} - \right. \\
 & \quad \left. \frac{\overline{112112}}{241920} - \frac{\overline{112122}}{120960} - \frac{\overline{112212}}{120960} - \frac{\overline{112222}}{120960} - \frac{\overline{121212}}{362880} - \frac{\overline{121222}}{120960} - \frac{\overline{122122}}{241920} - \frac{\overline{122222}}{120960} \right], \\
 & \quad M \left[\left\{ 1 \rightarrow LS [0, 0, 0, 0, 0, 0] \right\}, CWS \left[0, -\frac{\overline{11}}{96}, 0, \frac{\overline{1111}}{11520}, 0, -\frac{\overline{111111}}{725760} \right] \right] \}
 \end{aligned}$$

VerticalFlipEq[6, V]

$$\{0, 0, 0\}$$

```
sol7 = Solve[ (# == 0) & /@ Union[μCoefficients[{
  HardR4[8, V], TwistEq[7, V], UnitarityEq[7, V], CapEq[7, V, C]
}]]]
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$$\left\{ \left\{ \begin{aligned} \alpha_s[7, 1] &\rightarrow 0, \alpha_s[7, 3] \rightarrow 0, \beta_s[7, 1] \rightarrow \frac{1}{258048}, \alpha_s[7, 18] \rightarrow 0, \alpha_s[7, 2] \rightarrow 0, \\ \alpha_s[7, 5] &\rightarrow 0, \alpha_s[7, 14] \rightarrow 0, \beta_s[7, 2] \rightarrow -\frac{5}{387072}, \alpha_s[7, 4] \rightarrow 0, \alpha_s[7, 16] \rightarrow 0, \\ \beta_s[7, 3] &\rightarrow \frac{5}{290304}, \alpha_s[7, 10] \rightarrow 0, \alpha_s[7, 6] \rightarrow 0, \alpha_s[7, 7] \rightarrow 0, \alpha_s[7, 8] \rightarrow 0, \\ \beta_s[7, 4] &\rightarrow \frac{1}{64512}, \alpha_s[7, 17] \rightarrow 0, \beta_s[7, 5] \rightarrow -\frac{7}{1658880}, \alpha_s[7, 9] \rightarrow 0, \\ \alpha_s[7, 11] &\rightarrow 0, \beta_s[7, 6] \rightarrow \frac{1}{96768}, \alpha_s[7, 13] \rightarrow 0, \beta_s[7, 7] \rightarrow -\frac{1}{60480}, \\ \alpha_s[7, 12] &\rightarrow 0, \beta_s[7, 8] \rightarrow -\frac{1}{96768}, \beta_s[7, 9] \rightarrow -\frac{1}{207360}, \alpha_s[7, 15] \rightarrow 0, \\ \beta_s[7, 10] &\rightarrow 0, \beta_s[7, 11] \rightarrow -\frac{17}{1451520}, \beta_s[7, 12] \rightarrow 0, \beta_s[7, 13] \rightarrow \frac{1}{207360}, \\ \beta_s[7, 14] &\rightarrow 0, \beta_s[7, 15] \rightarrow 0, \beta_s[7, 16] \rightarrow 0, \beta_s[7, 17] \rightarrow 0, \beta_s[7, 18] \rightarrow 0, \\ \gamma_s[7, 1] &\rightarrow 0, \gamma_s[7, 2] \rightarrow 0, \gamma_s[7, 3] \rightarrow 0, \gamma_s[7, 4] \rightarrow 0, \gamma_s[7, 5] \rightarrow 0, \\ \gamma_s[7, 6] &\rightarrow 0, \gamma_s[7, 7] \rightarrow 0, \gamma_s[7, 8] \rightarrow 0, \gamma_s[7, 9] \rightarrow 0, \gamma_s[7, 10] \rightarrow 0, \\ \gamma_s[7, 11] &\rightarrow 0, \gamma_s[7, 12] \rightarrow 0, \gamma_s[7, 13] \rightarrow 0, \gamma_s[7, 14] \rightarrow 0, \gamma_s[7, 15] \rightarrow 0, \\ \gamma_s[7, 16] &\rightarrow 0, \gamma_s[7, 17] \rightarrow 0, \gamma_s[7, 18] \rightarrow 0, \gamma_s[7, 19] \rightarrow 0, \gamma_s[7, 20] \rightarrow 0 \end{aligned} \right\} \right\}$$

sol7 /. Rule -> Set; \$SeriesShowDegree = 7; {V, C}

$$\left\{ M \left[\left\{ 1 \rightarrow LS \left[0, -\frac{\overline{12}}{24}, 0, \frac{\overline{71112}}{5760} - \frac{\overline{71122}}{5760} + \frac{\overline{1222}}{1440}, 0, \right. \right. \right. \\ - \frac{\overline{3111112}}{967680} + \frac{\overline{3111122}}{483840} - \frac{\overline{8311222}}{967680} - \frac{\overline{3111222}}{725760} - \frac{\overline{31111212}}{645120} + \\ \left. \left. \left. \frac{\overline{13112222}}{241920} + \frac{\overline{101121222}}{1451520} + \frac{\overline{527112212}}{5806080} - \frac{\overline{122222}}{60480}, 0 \right\}, \right. \right. \\ \left. \left. 2 \rightarrow LS \left[\frac{\overline{1}}{2}, -\frac{\overline{12}}{12}, 0, \frac{\overline{1112}}{5760} - \frac{1}{720} \frac{\overline{1122}}{1222} + \frac{1}{720} \frac{\overline{1222}}{1222}, -\frac{\overline{11112}}{7680} + \frac{\overline{11122}}{3840} - \frac{\overline{11212}}{6912}, \right. \right. \right. \\ - \frac{\overline{111112}}{645120} + \frac{\overline{23111122}}{483840} - \frac{\overline{13111222}}{161280} - \frac{\overline{112122}}{22680} - \\ \frac{\overline{41111212}}{580608} + \frac{\overline{112222}}{15120} + \frac{\overline{121222}}{12096} + \frac{\overline{71112212}}{483840} - \frac{\overline{122222}}{30240}, \\ \frac{\overline{1111112}}{258048} - \frac{\overline{51111122}}{387072} + \frac{\overline{1111222}}{64512} + \frac{\overline{1112122}}{96768} + \frac{\overline{51111212}}{290304} - \frac{\overline{1112222}}{96768} - \\ \left. \left. \left. \frac{\overline{171121222}}{1451520} - \frac{\overline{1112212}}{60480} - \frac{\overline{1121122}}{207360} - \frac{\overline{71112112}}{1658880} + \frac{\overline{1122212}}{207360} \right\} \right], \right. \\ \left. CWS \left[0, -\frac{\overline{12}}{48}, 0, \frac{\overline{1112}}{2880} + \frac{\overline{1122}}{2880} + \frac{\overline{1212}}{5760} + \frac{\overline{1222}}{2880}, 0, \right. \right. \\ - \frac{\overline{111112}}{120960} - \frac{\overline{111122}}{120960} - \frac{\overline{111212}}{120960} - \frac{\overline{111222}}{120960} - \frac{\overline{112112}}{241920} - \frac{\overline{112122}}{120960} - \\ \left. \left. \left. \frac{\overline{112212}}{120960} - \frac{\overline{112222}}{120960} - \frac{\overline{121212}}{362880} - \frac{\overline{121222}}{120960} - \frac{\overline{122122}}{241920} - \frac{\overline{122222}}{120960}, 0 \right\} \right], \right. \\ \left. M \left[\left\{ 1 \rightarrow LS \left[0, 0, 0, 0, 0, 0, 0, 0 \right] \right\}, CWS \left[0, -\frac{\overline{11}}{96}, 0, \frac{\overline{1111}}{11520}, 0, -\frac{\overline{111111}}{725760}, 0 \right] \right\} \right]$$

VerticalFlipEq[7, V]

{0, 0, 0}

**sol8 = Solve[(# == 0) & /@ Union[μCoefficients[{
HardR4[9, V], TwistEq[8, V], UnitarityEq[8, V], CapEq[8, V, C]
}]]]**

$$\left\{ \left\{ \alpha s[8, 1] \rightarrow \frac{127}{154828800}, \beta s[8, 1] \rightarrow \frac{1}{77414400}, \alpha s[8, 3] \rightarrow \frac{127}{30965760}, \right. \right.$$

$$\begin{aligned}
 \alpha s[8, 30] &\rightarrow \frac{1}{2\,419\,200}, \alpha s[8, 5] \rightarrow -\frac{127}{77\,414\,400}, \alpha s[8, 2] \rightarrow -\frac{127}{51\,609\,600}, \\
 \alpha s[8, 4] &\rightarrow \frac{2399}{464\,486\,400}, \beta s[8, 2] \rightarrow -\frac{587}{464\,486\,400}, \alpha s[8, 25] \rightarrow -\frac{19}{9\,676\,800}, \\
 \alpha s[8, 10] &\rightarrow -\frac{733}{23\,224\,320} - 6\beta s[8, 27], \beta s[8, 3] \rightarrow \frac{929}{55\,738\,368} + 2\beta s[8, 27], \\
 \alpha s[8, 16] &\rightarrow -\frac{7549}{348\,364\,800} - 4\beta s[8, 27], \alpha s[8, 6] \rightarrow \frac{4589}{348\,364\,800} + 2\beta s[8, 27], \\
 \alpha s[8, 7] &\rightarrow \frac{5783}{696\,729\,600} + 4\beta s[8, 27], \alpha s[8, 28] \rightarrow -\frac{493}{29\,030\,400} - 2\beta s[8, 27], \\
 \alpha s[8, 8] &\rightarrow -\frac{2893}{464\,486\,400}, \beta s[8, 4] \rightarrow \frac{253}{66\,355\,200}, \alpha s[8, 15] \rightarrow \frac{271}{58\,060\,800}, \\
 \beta s[8, 5] &\rightarrow \frac{797}{232\,243\,200} + \beta s[8, 27], \alpha s[8, 29] \rightarrow -\frac{49}{1\,382\,400} - 5\beta s[8, 27], \\
 \alpha s[8, 9] &\rightarrow \frac{19}{9\,289\,728} + \beta s[8, 27], \alpha s[8, 12] \rightarrow \frac{3733}{232\,243\,200} + 2\beta s[8, 27], \\
 \alpha s[8, 20] &\rightarrow \frac{1661}{87\,091\,200} + \frac{3}{2}\beta s[8, 27], \beta s[8, 6] \rightarrow -\frac{3427}{348\,364\,800} - \frac{3}{2}\beta s[8, 27], \\
 \alpha s[8, 11] &\rightarrow -\frac{25\,399}{1\,393\,459\,200} - \frac{3}{2}\beta s[8, 27], \alpha s[8, 24] \rightarrow -\frac{121}{7\,257\,600} - \frac{3}{2}\beta s[8, 27], \\
 \beta s[8, 7] &\rightarrow -\frac{4697}{99\,532\,800} - \frac{9}{2}\beta s[8, 27], \alpha s[8, 13] \rightarrow -\frac{14\,099}{696\,729\,600} - \frac{9}{2}\beta s[8, 27], \\
 \alpha s[8, 14] &\rightarrow -\frac{16\,483}{1\,393\,459\,200} - \frac{9}{2}\beta s[8, 27], \beta s[8, 8] \rightarrow -\frac{43}{7\,257\,600}, \\
 \alpha s[8, 22] &\rightarrow -\frac{1933}{348\,364\,800} - \frac{3}{2}\beta s[8, 27], \beta s[8, 9] \rightarrow \frac{281}{92\,897\,280} + \frac{3}{2}\beta s[8, 27], \\
 \alpha s[8, 17] &\rightarrow \frac{6857}{464\,486\,400} + \frac{3}{2}\beta s[8, 27], \beta s[8, 10] \rightarrow \frac{271}{30\,965\,760}, \\
 \alpha s[8, 19] &\rightarrow \frac{9907}{348\,364\,800} + \frac{9}{2}\beta s[8, 27], \alpha s[8, 26] \rightarrow \frac{629}{12\,902\,400} + 6\beta s[8, 27], \\
 \alpha s[8, 18] &\rightarrow \frac{3239}{174\,182\,400} + \frac{9}{2}\beta s[8, 27], \alpha s[8, 21] \rightarrow \frac{449}{9\,676\,800} + 9\beta s[8, 27], \\
 \beta s[8, 11] &\rightarrow \frac{29}{24\,883\,200} + \frac{3}{2}\beta s[8, 27], \alpha s[8, 23] \rightarrow -\frac{299}{5\,529\,600} - \frac{15}{2}\beta s[8, 27], \\
 \beta s[8, 12] &\rightarrow \frac{2281}{464\,486\,400}, \beta s[8, 13] \rightarrow -\frac{1}{108\,864} - 3\beta s[8, 27], \\
 \beta s[8, 14] &\rightarrow \frac{1991}{174\,182\,400} - \frac{3}{2}\beta s[8, 27], \beta s[8, 15] \rightarrow \frac{73}{14\,515\,200}, \\
 \beta s[8, 16] &\rightarrow -\frac{5653}{1\,393\,459\,200} - \frac{3}{2}\beta s[8, 27], \alpha s[8, 27] \rightarrow -\frac{1}{30\,720} - \frac{9}{2}\beta s[8, 27], \\
 \beta s[8, 17] &\rightarrow \frac{47}{6\,451\,200}, \beta s[8, 18] \rightarrow \frac{41}{5\,443\,200} + 3\beta s[8, 27], \\
 \beta s[8, 19] &\rightarrow \frac{151}{14\,515\,200} + \frac{3}{2}\beta s[8, 27], \beta s[8, 20] \rightarrow -\frac{1}{1\,088\,640} - 2\beta s[8, 27], \\
 \beta s[8, 21] &\rightarrow -\frac{391}{17\,418\,240} - \frac{3}{2}\beta s[8, 27], \beta s[8, 22] \rightarrow -\frac{1313}{87\,091\,200} - 3\beta s[8, 27],
 \end{aligned}$$

$$\begin{aligned}
 \beta_s[8, 23] &\rightarrow -\frac{1}{92\,160}, \beta_s[8, 24] \rightarrow -\frac{151}{14\,515\,200}, \beta_s[8, 25] \rightarrow -\frac{1}{403\,200}, \\
 \beta_s[8, 26] &\rightarrow \frac{2459}{87\,091\,200} + 2\beta_s[8, 27], \beta_s[8, 28] \rightarrow -\frac{1}{172\,800}, \beta_s[8, 29] \rightarrow -\frac{1}{172\,800}, \\
 \beta_s[8, 30] &\rightarrow \frac{1}{1\,209\,600}, \gamma_s[8, 1] \rightarrow 0, \gamma_s[8, 2] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 3] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 4] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 5] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 6] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 7] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 8] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 9] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 10] &\rightarrow \frac{1}{9\,676\,800}, \gamma_s[8, 11] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 12] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 13] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 14] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 15] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 16] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 17] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 18] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 19] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 20] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 21] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 22] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 23] \rightarrow \frac{1}{9\,676\,800}, \gamma_s[8, 24] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 25] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 26] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 27] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 28] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 29] \rightarrow \frac{1}{19\,353\,600}, \gamma_s[8, 30] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 31] &\rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 32] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 33] \rightarrow \frac{1}{4\,838\,400}, \\
 \gamma_s[8, 34] &\rightarrow \frac{1}{9\,676\,800}, \gamma_s[8, 35] \rightarrow \frac{1}{4\,838\,400}, \gamma_s[8, 36] \rightarrow 0, \kappa_s[8] \rightarrow \frac{1}{38\,707\,200} \}}
 \end{aligned}$$

$\beta_s[8, 27] = 0$; sol8 /. Rule -> Set; \$SeriesShowDegree = 8; {V, C}

$$\begin{aligned}
 \{M[\{1 \rightarrow LS[0, -\frac{12}{24}, 0, \frac{71112}{5760} - \frac{71122}{5760} + \frac{1222}{1440}, 0, \\
 -\frac{31111112}{967680} + \frac{31111122}{483840} - \frac{83111222}{967680} - \frac{31112122}{725760} - \frac{31111212}{645120} + \\
 \frac{13112222}{241920} + \frac{101121222}{1451520} + \frac{527112212}{5806080} - \frac{122222}{60480}, 0, \\
 \frac{12711111112}{154828800} - \frac{12711111122}{51609600} + \frac{239911111222}{464486400} + \frac{458911112122}{348364800} +
 \end{aligned}$$

$$\frac{127 \overline{111} \overline{112} \overline{12}}{30\,965\,760} - \frac{2893 \overline{111} \overline{122} \overline{22}}{464\,486\,400} - \frac{25\,399 \overline{111} \overline{12} \overline{122} \overline{2}}{1\,393\,459\,200} + \frac{5783 \overline{111} \overline{122} \overline{12}}{696\,729\,600} +$$

$$\frac{271 \overline{11} \overline{122} \overline{222}}{58\,060\,800} + \frac{3239 \overline{112} \overline{12} \overline{122}}{174\,182\,400} + \frac{1661 \overline{112} \overline{122} \overline{22}}{87\,091\,200} + \frac{191 \overline{112} \overline{1} \overline{122}}{9\,289\,728} -$$

$$\frac{127 \overline{11} \overline{112} \overline{112}}{77\,414\,400} - \frac{14\,099 \overline{11} \overline{122} \overline{122}}{696\,729\,600} - \frac{16\,483 \overline{11} \overline{122} \overline{212}}{1\,393\,459\,200} -$$

$$\frac{1933 \overline{1} \overline{122} \overline{122} \overline{2}}{348\,364\,800} - \frac{733 \overline{1} \overline{112} \overline{1212}}{23\,224\,320} - \frac{191 \overline{122} \overline{222} \overline{2}}{9\,676\,800} + \frac{629 \overline{1212} \overline{122} \overline{2}}{12\,902\,400} -$$

$$\frac{493 \overline{12} \overline{122} \overline{222}}{29\,030\,400} + \frac{6857 \overline{112} \overline{1} \overline{122} \overline{2}}{464\,486\,400} - \frac{7549 \overline{112} \overline{112} \overline{12}}{348\,364\,800} +$$

$$\frac{3733 \overline{11} \overline{122} \overline{112}}{232\,243\,200} + \frac{9907 \overline{112} \overline{122} \overline{12}}{348\,364\,800} - \frac{2991 \overline{122} \overline{2} \overline{122}}{5\,529\,600} - \frac{1211 \overline{122} \overline{2212}}{7\,257\,600} -$$

$$\frac{49 \overline{122} \overline{122} \overline{22}}{1\,382\,400} - \frac{\overline{12} \overline{122} \overline{122}}{30\,720} + \frac{4491 \overline{122} \overline{1212}}{9\,676\,800} + \frac{\overline{122} \overline{222} \overline{22}}{2\,419\,200} \Big],$$

$$2 \rightarrow \text{LS} \left[\frac{1}{2}, -\frac{12}{12}, 0, \frac{\overline{1112}}{5760} - \frac{1}{720} \overline{1122} + \frac{1}{720} \overline{1222}, -\frac{\overline{11112}}{7680} + \frac{\overline{11122}}{3840} - \frac{\overline{11212}}{6912} \right],$$

$$-\frac{\overline{111112}}{645\,120} + \frac{\overline{23111122}}{483\,840} - \frac{\overline{13111222}}{161\,280} - \frac{\overline{112122}}{22\,680} -$$

$$\frac{\overline{41111212}}{580\,608} + \frac{\overline{112222}}{15\,120} + \frac{\overline{121222}}{12\,096} + \frac{\overline{71112212}}{483\,840} - \frac{\overline{122222}}{30\,240},$$

$$\frac{\overline{1111112}}{258\,048} - \frac{\overline{51111122}}{387\,072} + \frac{\overline{1111222}}{64\,512} + \frac{\overline{1112122}}{96\,768} + \frac{\overline{51111212}}{290\,304} - \frac{\overline{1112222}}{96\,768} -$$

$$\frac{\overline{171121222}}{1\,451\,520} - \frac{\overline{1112212}}{60\,480} - \frac{\overline{1121122}}{207\,360} - \frac{\overline{71112112}}{1\,658\,880} + \frac{\overline{1122212}}{207\,360},$$

$$\begin{aligned}
 & \frac{11111112}{77414400} - \frac{5871111122}{464486400} + \frac{25311111222}{66355200} - \frac{342711112122}{348364800} + \\
 & \frac{92911111212}{55738368} - \frac{43111122222}{7257600} + \frac{29111212222}{24883200} - \\
 & \frac{469711112212}{99532800} + \frac{73111222222}{14515200} + \frac{41112121222}{5443200} - \\
 & \frac{112122222}{1088640} + \frac{28111121122}{92897280} + \frac{79711112112}{232243200} - \frac{111221222}{108864} + \\
 & \frac{199111122212}{174182400} - \frac{131311221222}{87091200} + \frac{27111121212}{30965760} - \\
 & \frac{11222222}{403200} + \frac{245912121222}{87091200} - \frac{121222222}{172800} + \frac{47112112222}{6451200} - \\
 & \frac{565311211212}{1393459200} + \frac{228111122112}{464486400} + \frac{15111212212}{14515200} - \frac{112221222}{92160} - \\
 & \left. \left. \frac{15111222212}{14515200} - \frac{12212222}{172800} - \frac{39111221212}{17418240} + \frac{12222222}{1209600} \right\} \right\},
 \end{aligned}$$

$$\begin{aligned}
 & \text{CWS} \left[0, -\frac{12}{48}, 0, \frac{1112}{2880} + \frac{1122}{2880} + \frac{1212}{5760} + \frac{1222}{2880}, 0, \right. \\
 & -\frac{111112}{120960} - \frac{111122}{120960} - \frac{111212}{120960} - \frac{111222}{120960} - \frac{112112}{241920} - \frac{112122}{120960} - \\
 & \frac{112212}{120960} - \frac{112222}{120960} - \frac{121212}{362880} - \frac{121222}{120960} - \frac{122122}{241920} - \frac{122222}{120960}, 0, \\
 & \frac{11111112}{4838400} + \frac{11111122}{4838400} + \frac{11111212}{4838400} + \frac{11111222}{4838400} + \frac{11112112}{4838400} + \frac{11112122}{4838400} + \\
 & \frac{11112212}{4838400} + \frac{11112222}{4838400} + \frac{11121112}{9676800} + \frac{11121122}{4838400} + \frac{11121212}{4838400} + \\
 & \frac{11121222}{4838400} + \frac{11122112}{4838400} + \frac{11122122}{4838400} + \frac{11122212}{4838400} + \frac{11122222}{4838400} + \frac{11211212}{4838400} +
 \end{aligned}$$

$$\begin{aligned}
 & \left[\frac{\overline{11211222}}{4838400} + \frac{\overline{11212122}}{4838400} + \frac{\overline{11212212}}{4838400} + \frac{\overline{11212222}}{4838400} + \frac{\overline{11221122}}{9676800} + \frac{\overline{11221212}}{4838400} + \right. \\
 & \left. \frac{\overline{11221222}}{4838400} + \frac{\overline{11222122}}{4838400} + \frac{\overline{11222212}}{4838400} + \frac{\overline{11222222}}{4838400} + \frac{\overline{12121212}}{19353600} + \frac{\overline{12121222}}{4838400} + \right. \\
 & \left. \frac{\overline{12122122}}{4838400} + \frac{\overline{12122222}}{4838400} + \frac{\overline{12212222}}{4838400} + \frac{\overline{12221222}}{9676800} + \frac{\overline{12222222}}{4838400} \right], \\
 & M \left[\{1 \rightarrow \text{LS}[0, 0, 0, 0, 0, 0, 0, 0, 0]\}, \text{CWS} \left[0, -\frac{\overline{11}}{96}, 0, \frac{\overline{1111}}{11520}, \right. \right. \\
 & \left. \left. 0, -\frac{\overline{111111}}{725760}, 0, \frac{\overline{11111111}}{38707200} \right] \right]
 \end{aligned}$$

VerticalFlipEq[8, V]

{0, 0, 0}

**sol9 = Solve[(# == 0) & /@ Union[μCoefficients[
 HardR4[10, V], TwistEq[9, V], UnitarityEq[9, V], CapEq[9, V, C]
]]]]**

$$\begin{aligned}
 & \left\{ \left\{ \alpha_s[9, 1] \rightarrow 0, \alpha_s[9, 3] \rightarrow 0, \beta_s[9, 1] \rightarrow -\frac{1}{9830400}, \alpha_s[9, 9] \rightarrow 0, \alpha_s[9, 56] \rightarrow 0, \right. \right. \\
 & \alpha_s[9, 2] \rightarrow 0, \alpha_s[9, 5] \rightarrow 0, \alpha_s[9, 48] \rightarrow 0, \beta_s[9, 2] \rightarrow \frac{43}{88473600}, \alpha_s[9, 4] \rightarrow 0, \\
 & \alpha_s[9, 11] \rightarrow 0, \beta_s[9, 3] \rightarrow \frac{1271}{619315200}, \alpha_s[9, 53] \rightarrow 0, \alpha_s[9, 6] \rightarrow 0, \alpha_s[9, 7] \rightarrow 0, \\
 & \alpha_s[9, 30] \rightarrow 0, \beta_s[9, 4] \rightarrow -\frac{91}{88473600}, \alpha_s[9, 8] \rightarrow 0, \alpha_s[9, 54] \rightarrow 0, \\
 & \beta_s[9, 5] \rightarrow \frac{6589}{2786918400}, \alpha_s[9, 13] \rightarrow 0, \alpha_s[9, 10] \rightarrow 0, \alpha_s[9, 39] \rightarrow 0, \\
 & \beta_s[9, 6] \rightarrow -\frac{13}{1474560}, \alpha_s[9, 12] \rightarrow 0, \alpha_s[9, 47] \rightarrow 0, \beta_s[9, 7] \rightarrow -\frac{14867}{928972800}, \\
 & \alpha_s[9, 15] \rightarrow 0, \alpha_s[9, 14] \rightarrow 0, \alpha_s[9, 16] \rightarrow 0, \beta_s[9, 8] \rightarrow \frac{19}{14745600}, \alpha_s[9, 20] \rightarrow 0, \\
 & \beta_s[9, 9] \rightarrow -\frac{533}{5573836800}, \alpha_s[9, 18] \rightarrow 0, \alpha_s[9, 55] \rightarrow 0, \alpha_s[9, 17] \rightarrow 0, \alpha_s[9, 43] \rightarrow 0, \\
 & \beta_s[9, 10] \rightarrow \frac{863}{1857945600}, \alpha_s[9, 19] \rightarrow 0, \alpha_s[9, 35] \rightarrow 0, \beta_s[9, 11] \rightarrow \frac{58651}{3344302080}, \\
 & \alpha_s[9, 50] \rightarrow 0, \alpha_s[9, 22] \rightarrow 0, \alpha_s[9, 21] \rightarrow 0, \alpha_s[9, 25] \rightarrow 0, \alpha_s[9, 23] \rightarrow 0, \\
 & \beta_s[9, 12] \rightarrow \frac{389}{44236800}, \beta_s[9, 13] \rightarrow -\frac{40511}{5573836800}, \alpha_s[9, 27] \rightarrow 0, \alpha_s[9, 46] \rightarrow 0, \\
 & \alpha_s[9, 24] \rightarrow 0, \alpha_s[9, 26] \rightarrow 0, \beta_s[9, 14] \rightarrow \frac{173}{22118400}, \alpha_s[9, 29] \rightarrow 0, \alpha_s[9, 33] \rightarrow 0, \\
 & \beta_s[9, 15] \rightarrow \frac{22289}{2786918400}, \alpha_s[9, 28] \rightarrow 0, \beta_s[9, 16] \rightarrow -\frac{1}{1105920}, \alpha_s[9, 45] \rightarrow 0, \\
 & \beta_s[9, 17] \rightarrow -\frac{127}{557383680}, \alpha_s[9, 51] \rightarrow 0, \beta_s[9, 18] \rightarrow \frac{158057}{16721510400}, \alpha_s[9, 31] \rightarrow 0,
 \end{aligned}$$

$$\begin{aligned}
 \alpha_s[9, 32] &\rightarrow 0, \beta_s[9, 19] \rightarrow -\frac{5483}{928\,972\,800}, \alpha_s[9, 34] \rightarrow 0, \beta_s[9, 20] \rightarrow \frac{221}{1\,672\,151\,040}, \\
 \alpha_s[9, 52] &\rightarrow 0, \alpha_s[9, 36] \rightarrow 0, \beta_s[9, 21] \rightarrow -\frac{41}{5\,529\,600}, \alpha_s[9, 38] \rightarrow 0, \\
 \beta_s[9, 22] &\rightarrow -\frac{4979}{418\,037\,760}, \alpha_s[9, 37] \rightarrow 0, \beta_s[9, 23] \rightarrow -\frac{1}{102\,400}, \alpha_s[9, 40] \rightarrow 0, \\
 \beta_s[9, 24] &\rightarrow \frac{11}{398\,131\,200}, \alpha_s[9, 44] \rightarrow 0, \beta_s[9, 25] \rightarrow -\frac{79\,081}{2\,786\,918\,400}, \alpha_s[9, 41] \rightarrow 0, \\
 \alpha_s[9, 42] &\rightarrow 0, \beta_s[9, 26] \rightarrow -\frac{43}{49\,766\,400}, \beta_s[9, 27] \rightarrow \frac{143}{348\,364\,800}, \beta_s[9, 28] \rightarrow \frac{1217}{49\,766\,400}, \\
 \beta_s[9, 29] &\rightarrow \frac{2113}{348\,364\,800}, \beta_s[9, 30] \rightarrow \frac{1}{2\,764\,800}, \beta_s[9, 31] \rightarrow -\frac{1}{6\,531\,840}, \\
 \beta_s[9, 32] &\rightarrow \frac{5}{13\,934\,592}, \beta_s[9, 33] \rightarrow \frac{1}{4\,354\,560}, \beta_s[9, 34] \rightarrow -\frac{1}{13\,271\,040}, \\
 \alpha_s[9, 49] &\rightarrow 0, \beta_s[9, 35] \rightarrow \frac{7}{238\,878\,720}, \beta_s[9, 36] \rightarrow -\frac{1217}{69\,672\,960}, \beta_s[9, 37] \rightarrow \frac{1}{61\,440}, \\
 \beta_s[9, 38] &\rightarrow \frac{1}{3\,483\,648}, \beta_s[9, 39] \rightarrow \frac{1217}{174\,182\,400}, \beta_s[9, 40] \rightarrow -\frac{1}{12\,441\,600}, \beta_s[9, 41] \rightarrow 0, \\
 \beta_s[9, 42] &\rightarrow 0, \beta_s[9, 43] \rightarrow \frac{1}{61\,440}, \beta_s[9, 44] \rightarrow 0, \beta_s[9, 45] \rightarrow -\frac{1}{24\,883\,200}, \\
 \beta_s[9, 46] &\rightarrow 0, \beta_s[9, 47] \rightarrow -\frac{1}{8\,709\,120}, \beta_s[9, 48] \rightarrow 0, \beta_s[9, 49] \rightarrow 0, \beta_s[9, 50] \rightarrow 0, \\
 \beta_s[9, 51] &\rightarrow 0, \beta_s[9, 52] \rightarrow 0, \beta_s[9, 53] \rightarrow 0, \beta_s[9, 54] \rightarrow 0, \beta_s[9, 55] \rightarrow 0, \\
 \beta_s[9, 56] &\rightarrow 0, \gamma_s[9, 1] \rightarrow 0, \gamma_s[9, 2] \rightarrow 0, \gamma_s[9, 3] \rightarrow 0, \gamma_s[9, 4] \rightarrow 0, \gamma_s[9, 5] \rightarrow 0, \\
 \gamma_s[9, 6] &\rightarrow 0, \gamma_s[9, 7] \rightarrow 0, \gamma_s[9, 8] \rightarrow 0, \gamma_s[9, 9] \rightarrow 0, \gamma_s[9, 10] \rightarrow 0, \gamma_s[9, 11] \rightarrow 0, \\
 \gamma_s[9, 12] &\rightarrow 0, \gamma_s[9, 13] \rightarrow 0, \gamma_s[9, 14] \rightarrow 0, \gamma_s[9, 15] \rightarrow 0, \gamma_s[9, 16] \rightarrow 0, \gamma_s[9, 17] \rightarrow 0, \\
 \gamma_s[9, 18] &\rightarrow 0, \gamma_s[9, 19] \rightarrow 0, \gamma_s[9, 20] \rightarrow 0, \gamma_s[9, 21] \rightarrow 0, \gamma_s[9, 22] \rightarrow 0, \gamma_s[9, 23] \rightarrow 0, \\
 \gamma_s[9, 24] &\rightarrow 0, \gamma_s[9, 25] \rightarrow 0, \gamma_s[9, 26] \rightarrow 0, \gamma_s[9, 27] \rightarrow 0, \gamma_s[9, 28] \rightarrow 0, \gamma_s[9, 29] \rightarrow 0, \\
 \gamma_s[9, 30] &\rightarrow 0, \gamma_s[9, 31] \rightarrow 0, \gamma_s[9, 32] \rightarrow 0, \gamma_s[9, 33] \rightarrow 0, \gamma_s[9, 34] \rightarrow 0, \gamma_s[9, 35] \rightarrow 0, \\
 \gamma_s[9, 36] &\rightarrow 0, \gamma_s[9, 37] \rightarrow 0, \gamma_s[9, 38] \rightarrow 0, \gamma_s[9, 39] \rightarrow 0, \gamma_s[9, 40] \rightarrow 0, \\
 \gamma_s[9, 41] &\rightarrow 0, \gamma_s[9, 42] \rightarrow 0, \gamma_s[9, 43] \rightarrow 0, \gamma_s[9, 44] \rightarrow 0, \gamma_s[9, 45] \rightarrow 0, \\
 \gamma_s[9, 46] &\rightarrow 0, \gamma_s[9, 47] \rightarrow 0, \gamma_s[9, 48] \rightarrow 0, \gamma_s[9, 49] \rightarrow 0, \gamma_s[9, 50] \rightarrow 0, \\
 \gamma_s[9, 51] &\rightarrow 0, \gamma_s[9, 52] \rightarrow 0, \gamma_s[9, 53] \rightarrow 0, \gamma_s[9, 54] \rightarrow 0, \gamma_s[9, 55] \rightarrow 0, \\
 \gamma_s[9, 56] &\rightarrow 0, \gamma_s[9, 57] \rightarrow 0, \gamma_s[9, 58] \rightarrow 0, \gamma_s[9, 59] \rightarrow 0, \gamma_s[9, 60] \rightarrow 0 \}
 \end{aligned}$$

sol9 /. Rule -> Set; \$SeriesShowDegree = 9; {V, C}

$$\begin{aligned}
 \{M[\{1 \rightarrow LS[0, -\frac{\overline{12}}{24}, 0, \frac{\overline{71112}}{5760} - \frac{\overline{71122}}{5760} + \frac{\overline{1222}}{1440}, 0, \\
 -\frac{\overline{31111112}}{967680} + \frac{\overline{31111122}}{483840} - \frac{\overline{83111222}}{967680} - \frac{\overline{31112122}}{725760} - \frac{\overline{31111212}}{645120} + \\
 \frac{\overline{13112222}}{241920} + \frac{\overline{101121222}}{1451520} + \frac{\overline{527112212}}{5806080} - \frac{\overline{122222}}{60480}, 0,
 \end{aligned}$$

$$\frac{12711111112}{154828800} - \frac{12711111122}{51609600} + \frac{239911111222}{464486400} + \frac{458911112122}{348364800} +$$

$$\frac{12711111212}{30965760} - \frac{289311112222}{464486400} - \frac{2539911121222}{1393459200} + \frac{578311112212}{696729600} +$$

$$\frac{27111122222}{58060800} + \frac{323911212122}{174182400} + \frac{1661112122222}{87091200} + \frac{1911121122}{9289728} -$$

$$\frac{12711112112}{77414400} - \frac{1409911122122}{696729600} - \frac{1648311122212}{1393459200} -$$

$$\frac{193311221222}{348364800} - \frac{73311121212}{23224320} - \frac{1911222222}{9676800} + \frac{62912121222}{12902400} -$$

$$\frac{49312122222}{29030400} + \frac{685711211222}{464486400} - \frac{754911211212}{348364800} +$$

$$\frac{373311122112}{232243200} + \frac{990711212212}{348364800} - \frac{29911222122}{5529600} - \frac{12111222212}{7257600} -$$

$$\frac{4912212222}{1382400} - \frac{12122122}{30720} + \frac{44911221212}{9676800} + \frac{12222222}{2419200}, 0],$$

$$2 \rightarrow \text{LS} \left[\frac{1}{2}, -\frac{12}{12}, 0, \frac{1112}{5760} - \frac{1}{720} 1122 + \frac{1}{720} 1222, -\frac{11112}{7680} + \frac{11122}{3840} - \frac{11212}{6912}, \right.$$

$$\left. -\frac{111112}{645120} + \frac{23111122}{483840} - \frac{13111222}{161280} - \frac{112122}{22680} -$$

$$\frac{41111212}{580608} + \frac{112222}{15120} + \frac{121222}{12096} + \frac{71112212}{483840} - \frac{122222}{30240},$$

$$\frac{1111112}{258048} - \frac{51111122}{387072} + \frac{1111222}{64512} + \frac{1112122}{96768} + \frac{51111212}{290304} - \frac{1112222}{96768} -$$

$$\begin{aligned}
 & \frac{171121222}{1451520} - \frac{1112212}{60480} - \frac{1121122}{207360} - \frac{71112112}{1658880} + \frac{1122212}{207360}, \\
 & \frac{11111112}{77414400} - \frac{5871111122}{464486400} + \frac{2531111222}{66355200} - \frac{342711112122}{348364800} + \\
 & \frac{92911111212}{55738368} - \frac{4311112222}{7257600} + \frac{2911121222}{24883200} - \frac{469711112212}{99532800} + \\
 & \frac{7311122222}{14515200} + \frac{4111212122}{5443200} - \frac{11212222}{1088640} + \frac{28111121122}{92897280} + \\
 & \frac{79711112112}{232243200} - \frac{11122122}{108864} + \frac{199111122212}{174182400} - \frac{131311221222}{87091200} + \\
 & \frac{27111121212}{30965760} - \frac{11222222}{403200} + \frac{245912121222}{87091200} - \frac{12122222}{172800} + \\
 & \frac{4711211222}{6451200} - \frac{565311211212}{1393459200} + \frac{228111122112}{464486400} + \frac{15111212212}{14515200} - \\
 & \frac{11222122}{92160} - \frac{15111222212}{14515200} - \frac{12212222}{172800} - \frac{39111221212}{17418240} + \frac{12222222}{1209600}, \\
 & - \frac{111111112}{9830400} + \frac{4311111122}{88473600} - \frac{91111111222}{88473600} - \frac{13111112122}{1474560} + \\
 & \frac{1271111111212}{619315200} + \frac{19111112222}{14745600} + \frac{389111121222}{44236800} - \\
 & \frac{14867111112212}{928972800} - \frac{111122222}{1105920} - \frac{41111212122}{5529600} - \frac{111212222}{102400} +
 \end{aligned}$$

$$\begin{aligned}
 & \frac{863 \overline{111121122}}{1857945600} + \frac{6589 \overline{111112112}}{2786918400} + \frac{173 \overline{111122122}}{22118400} + \\
 & \frac{22289 \overline{111122212}}{2786918400} - \frac{43 \overline{111221222}}{49766400} + \frac{58651 \overline{111121212}}{3344302080} + \\
 & \frac{11 \overline{1222222}}{2764800} - \frac{1217 \overline{112121222}}{69672960} + \frac{1217 \overline{112122222}}{174182400} - \frac{5483 \overline{111211222}}{928972800} + \\
 & \frac{158057 \overline{111211212}}{16721510400} - \frac{40511 \overline{111122112}}{5573836800} - \frac{4979 \overline{111212212}}{418037760} + \\
 & \frac{1217 \overline{111222122}}{49766400} + \frac{2113 \overline{111222212}}{348364800} + \frac{1 \overline{12212222}}{61440} + \frac{1 \overline{12122122}}{61440} - \\
 & \frac{79081 \overline{111221212}}{2786918400} - \frac{1 \overline{12112122}}{6531840} + \frac{1 \overline{12112222}}{4354560} + \frac{5 \overline{112112212}}{13934592} - \\
 & \frac{127 \overline{111211122}}{557383680} - \frac{533 \overline{111121112}}{5573836800} + \frac{11 \overline{111221122}}{398131200} + \\
 & \frac{143 \overline{111222112}}{348364800} - \frac{1 \overline{12211222}}{12441600} + \frac{1 \overline{12122212}}{3483648} + \frac{221 \overline{111212112}}{1672151040} - \\
 & \left. \frac{1 \overline{12221222}}{24883200} - \frac{1 \overline{12222212}}{8709120} - \frac{1 \overline{12121122}}{13271040} + \frac{7 \overline{112121212}}{238878720} \right\},
 \end{aligned}$$

$$\begin{aligned}
 \text{CWS} & \left[0, -\frac{12}{48}, 0, \frac{1112}{2880} + \frac{1122}{2880} + \frac{1212}{5760} + \frac{1222}{2880}, 0, \right. \\
 & - \frac{\overline{111112}}{120960} - \frac{\overline{111122}}{120960} - \frac{\overline{111212}}{120960} - \frac{\overline{111222}}{120960} - \frac{\overline{112112}}{241920} - \frac{\overline{112122}}{120960} - \\
 & \frac{\overline{112212}}{120960} - \frac{\overline{112222}}{120960} - \frac{\overline{121212}}{362880} - \frac{\overline{121222}}{120960} - \frac{\overline{122122}}{241920} - \frac{\overline{122222}}{120960}, \\
 & 0, \frac{\overline{1111112}}{4838400} + \frac{\overline{1111122}}{4838400} + \frac{\overline{1111212}}{4838400} + \frac{\overline{1111222}}{4838400} + \frac{\overline{1112112}}{4838400} + \\
 & \frac{\overline{1112122}}{4838400} + \frac{\overline{1112212}}{4838400} + \frac{\overline{1112222}}{4838400} + \frac{\overline{11121112}}{9676800} + \frac{\overline{11121122}}{4838400} +
 \end{aligned}$$

$$\begin{aligned} & \frac{\overline{11121212}}{4838400} + \frac{\overline{11121222}}{4838400} + \frac{\overline{11122112}}{4838400} + \frac{\overline{11122122}}{4838400} + \frac{\overline{11122212}}{4838400} + \\ & \frac{\overline{11122222}}{4838400} + \frac{\overline{11211212}}{4838400} + \frac{\overline{11211222}}{4838400} + \frac{\overline{11212122}}{4838400} + \frac{\overline{11212212}}{4838400} + \\ & \frac{\overline{11212222}}{4838400} + \frac{\overline{11221122}}{9676800} + \frac{\overline{11221212}}{4838400} + \frac{\overline{11221222}}{4838400} + \frac{\overline{11222122}}{4838400} + \\ & \frac{\overline{11222212}}{4838400} + \frac{\overline{11222222}}{4838400} + \frac{\overline{12121212}}{19353600} + \frac{\overline{12121222}}{4838400} + \frac{\overline{12122122}}{4838400} + \\ & \frac{\overline{12122222}}{4838400} + \frac{\overline{12212222}}{4838400} + \frac{\overline{12221222}}{9676800} + \frac{\overline{12222222}}{4838400}, 0 \end{aligned}$$

$$M[\{1 \rightarrow \text{LS}[0, 0, 0, 0, 0, 0, 0, 0, 0, 0]\},$$

$$\text{CWS}\left[0, -\frac{\overline{11}}{96}, 0, \frac{\overline{1111}}{11520}, 0, -\frac{\overline{111111}}{725760}, 0, \frac{\overline{11111111}}{38707200}, 0\right]$$

VerticalFlipEq[9, V]

$$\{0, 0, 0\}$$

**sol10 = Solve[(# == 0) & /@ Union[μCoefficients[{
HardR4[11, V], TwistEq[10, V], UnitarityEq[10, V], CapEq[10, V, C]
}]]]**

$$\left\{ \left\{ \begin{aligned} \alpha s[10, 1] &\rightarrow -\frac{73}{3503554560}, \alpha s[10, 9] \rightarrow -\frac{73}{1401421824}, \beta s[10, 1] \rightarrow -\frac{1}{9809952768}, \\ \alpha s[10, 3] &\rightarrow -\frac{511}{2335703040}, \alpha s[10, 99] \rightarrow -\frac{1}{95800320}, \alpha s[10, 2] \rightarrow \frac{73}{875888640}, \\ \alpha s[10, 5] &\rightarrow \frac{73}{350355456}, \beta s[10, 2] \rightarrow \frac{1129}{35035545600}, \alpha s[10, 88] \rightarrow \frac{5}{76640256}, \\ \alpha s[10, 4] &\rightarrow -\frac{1621}{6812467200}, \alpha s[10, 11] \rightarrow \frac{617777}{49049763840} + 10 \beta s[10, 96], \\ \beta s[10, 3] &\rightarrow -\frac{1698659}{735746457600} - 2 \beta s[10, 96], \alpha s[10, 6] \rightarrow -\frac{18539}{6569164800} - 2 \beta s[10, 96], \\ \alpha s[10, 95] &\rightarrow \frac{10013}{3832012800} + 2 \beta s[10, 96], \alpha s[10, 7] \rightarrow -\frac{471703}{105106636800} - 4 \beta s[10, 96], \\ \alpha s[10, 8] &\rightarrow \frac{12941}{30656102400}, \beta s[10, 4] \rightarrow -\frac{34747}{245248819200}, \alpha s[10, 57] \rightarrow -\frac{59}{283852800}, \\ \alpha s[10, 97] &\rightarrow \frac{1679}{191600640} + 7 \beta s[10, 96], \beta s[10, 5] \rightarrow \frac{194479}{122624409600} + \beta s[10, 96], \\ \alpha s[10, 10] &\rightarrow \frac{45121}{35035545600} + \beta s[10, 96], \alpha s[10, 13] \rightarrow \frac{34229}{35035545600} + 2 \beta s[10, 96], \\ \alpha s[10, 34] &\rightarrow \frac{1280467}{367873228800} + 3 \beta s[10, 96], \alpha s[10, 73] \rightarrow -\frac{4883}{1149603840} - \frac{5}{2} \beta s[10, 96], \\ \beta s[10, 6] &\rightarrow \frac{116761}{61312204800} + \frac{5}{2} \beta s[10, 96], \alpha s[10, 12] \rightarrow \frac{383}{87091200} + \frac{5}{2} \beta s[10, 96], \end{aligned} \right. \right\}$$

$$\begin{aligned}
 \alpha s[10, 87] &\rightarrow \frac{52807}{15328051200} + \frac{5}{2} \beta s[10, 96], \beta s[10, 7] \rightarrow \frac{25271}{3344302080} + \frac{15}{2} \beta s[10, 96], \\
 \alpha s[10, 15] &\rightarrow \frac{6461969}{735746457600} + \frac{15}{2} \beta s[10, 96], \alpha s[10, 14] \rightarrow \frac{65459}{6569164800} + \frac{15}{2} \beta s[10, 96], \\
 \alpha s[10, 31] &\rightarrow \frac{6103}{15328051200}, \beta s[10, 8] \rightarrow \frac{3349}{10218700800}, \alpha s[10, 16] \rightarrow -\frac{2281}{4541644800}, \\
 \beta s[10, 9] &\rightarrow \frac{270493}{245248819200} + \beta s[10, 96], \alpha s[10, 20] \rightarrow -\frac{2666999}{122624409600} - 19 \beta s[10, 96], \\
 \alpha s[10, 18] &\rightarrow \frac{4751993}{735746457600} + 5 \beta s[10, 96], \alpha s[10, 98] \rightarrow \frac{16699}{1916006400} + 7 \beta s[10, 96], \\
 \alpha s[10, 24] &\rightarrow \frac{2689}{1061683200} + 2 \beta s[10, 96], \alpha s[10, 17] \rightarrow \frac{16927}{17517772800} + \beta s[10, 96], \\
 \alpha s[10, 32] &\rightarrow -\frac{34997}{7664025600} - 4 \beta s[10, 96], \alpha s[10, 80] \rightarrow -\frac{7039}{851558400} - \frac{9}{2} \beta s[10, 96], \\
 \beta s[10, 10] &\rightarrow -\frac{1873}{3269984256} - \frac{1}{2} \beta s[10, 96], \alpha s[10, 19] \rightarrow -\frac{152807}{81749606400} - \frac{1}{2} \beta s[10, 96], \\
 \alpha s[10, 39] &\rightarrow \frac{317831}{16349921280} + 15 \beta s[10, 96], \beta s[10, 11] \rightarrow -\frac{2551573}{735746457600} - 5 \beta s[10, 96], \\
 \alpha s[10, 91] &\rightarrow -\frac{904049}{45984153600} - 15 \beta s[10, 96], \alpha s[10, 22] \rightarrow -\frac{35347}{973209600} - \frac{51}{2} \beta s[10, 96], \\
 \alpha s[10, 26] &\rightarrow -\frac{21706621}{367873228800} - 45 \beta s[10, 96], \alpha s[10, 21] \rightarrow -\frac{1159}{82114560} - \frac{21}{2} \beta s[10, 96], \\
 \alpha s[10, 44] &\rightarrow \frac{136127}{30656102400} + \frac{61}{32} \beta s[10, 96], \beta s[10, 12] \rightarrow \frac{1}{20528640} - \frac{61}{32} \beta s[10, 96], \\
 \alpha s[10, 23] &\rightarrow -\frac{30953}{7357464576} - \frac{61}{32} \beta s[10, 96], \alpha s[10, 86] \rightarrow \frac{101197}{7664025600} + \frac{21}{2} \beta s[10, 96], \\
 \beta s[10, 13] &\rightarrow -\frac{128077}{22295347200} - 3 \beta s[10, 96], \alpha s[10, 28] \rightarrow -\frac{255307}{122624409600} - 3 \beta s[10, 96], \\
 \alpha s[10, 25] &\rightarrow -\frac{24103}{8758886400} - 3 \beta s[10, 96], \alpha s[10, 56] \rightarrow -\frac{47701}{22992076800} - \frac{3}{32} \beta s[10, 96], \\
 \alpha s[10, 63] &\rightarrow -\frac{4831}{1703116800} - \frac{61}{32} \beta s[10, 96], \beta s[10, 14] \rightarrow \frac{5837}{15328051200} - 2 \beta s[10, 96], \\
 \alpha s[10, 27] &\rightarrow -\frac{2119787}{367873228800} - \frac{125}{32} \beta s[10, 96], \\
 \beta s[10, 15] &\rightarrow -\frac{4493}{1513881600} - \frac{125}{32} \beta s[10, 96], \\
 \alpha s[10, 29] &\rightarrow -\frac{36703}{4541644800} - \frac{253}{32} \beta s[10, 96], \\
 \alpha s[10, 30] &\rightarrow -\frac{2094149}{735746457600} - \frac{125}{32} \beta s[10, 96], \beta s[10, 16] \rightarrow -\frac{4001}{8758886400}, \\
 \alpha s[10, 83] &\rightarrow -\frac{2501}{5748019200} + \beta s[10, 96], \beta s[10, 17] \rightarrow \frac{80447}{30656102400} + \frac{5}{2} \beta s[10, 96], \\
 \alpha s[10, 33] &\rightarrow \frac{161587}{49049763840} + \frac{5}{2} \beta s[10, 96], \alpha s[10, 92] \rightarrow -\frac{105233}{5109350400} - \frac{31}{2} \beta s[10, 96], \\
 \beta s[10, 18] &\rightarrow -\frac{1606277}{735746457600} - \frac{7}{2} \beta s[10, 96], \alpha s[10, 35] \rightarrow
 \end{aligned}$$

$$\begin{aligned}
 & -\frac{77\,969}{8\,758\,886\,400} - \frac{11}{2} \beta_s[10, 96], \alpha_s[10, 36] \rightarrow -\frac{29\,767\,223}{735\,746\,457\,600} - \frac{67}{2} \beta_s[10, 96], \\
 \alpha_s[10, 50] & \rightarrow \frac{739\,763}{91\,968\,307\,200} + \frac{151}{32} \beta_s[10, 96], \beta_s[10, 19] \rightarrow -\frac{110\,491}{40\,874\,803\,200} - \beta_s[10, 96], \\
 \alpha_s[10, 37] & \rightarrow \frac{17\,827}{49\,049\,763\,840} - \beta_s[10, 96], \alpha_s[10, 94] \rightarrow \frac{14\,647}{383\,201\,280} + \frac{61}{2} \beta_s[10, 96], \\
 \beta_s[10, 20] & \rightarrow -\frac{7499}{3\,832\,012\,800} - \frac{5}{2} \beta_s[10, 96], \alpha_s[10, 41] \rightarrow \frac{48\,227}{5\,255\,331\,840} + \frac{15}{2} \beta_s[10, 96], \\
 \alpha_s[10, 47] & \rightarrow \frac{17\,586\,761}{735\,746\,457\,600} + 21 \beta_s[10, 96], \alpha_s[10, 38] \rightarrow \frac{50\,111}{13\,377\,208\,320} + \frac{5}{2} \beta_s[10, 96], \\
 \alpha_s[10, 67] & \rightarrow \frac{3557}{766\,402\,560} - \frac{1}{4} \beta_s[10, 96], \beta_s[10, 21] \rightarrow -\frac{69\,691}{30\,656\,102\,400} + \frac{49}{32} \beta_s[10, 96], \\
 \alpha_s[10, 40] & \rightarrow \frac{96\,577}{73\,574\,645\,760} + \frac{81}{32} \beta_s[10, 96], \\
 \alpha_s[10, 72] & \rightarrow -\frac{131\,413}{10\,218\,700\,800} - \frac{305}{32} \beta_s[10, 96], \\
 \beta_s[10, 22] & \rightarrow -\frac{103\,403}{10\,218\,700\,800} + \frac{5}{2} \beta_s[10, 96], \alpha_s[10, 42] \rightarrow \\
 & \frac{3937}{26\,276\,659\,200} - \frac{33}{32} \beta_s[10, 96], \alpha_s[10, 43] \rightarrow \frac{8\,792\,369}{735\,746\,457\,600} + \frac{231}{32} \beta_s[10, 96], \\
 \beta_s[10, 23] & \rightarrow -\frac{535}{919\,683\,072} + \frac{61}{32} \beta_s[10, 96], \alpha_s[10, 45] \rightarrow \frac{321\,179}{49\,049\,763\,840} + 6 \beta_s[10, 96], \\
 \beta_s[10, 24] & \rightarrow \frac{9407}{61\,312\,204\,800}, \alpha_s[10, 85] \rightarrow \frac{44\,689}{2\,554\,675\,200} + 14 \beta_s[10, 96], \\
 \alpha_s[10, 55] & \rightarrow -\frac{428\,251}{91\,968\,307\,200} - \frac{9}{32} \beta_s[10, 96], \alpha_s[10, 75] \rightarrow \\
 & -\frac{187\,391}{30\,656\,102\,400} - \frac{77}{16} \beta_s[10, 96], \beta_s[10, 25] \rightarrow \frac{863}{2\,554\,675\,200} - \frac{29}{32} \beta_s[10, 96], \\
 \alpha_s[10, 46] & \rightarrow -\frac{44\,771}{30\,656\,102\,400} - \frac{61}{32} \beta_s[10, 96], \alpha_s[10, 84] \rightarrow \\
 & \frac{20\,819}{8\,360\,755\,200} + \frac{23}{32} \beta_s[10, 96], \beta_s[10, 26] \rightarrow -\frac{1\,887\,947}{183\,936\,614\,400} + \frac{159}{32} \beta_s[10, 96], \\
 \alpha_s[10, 49] & \rightarrow \frac{7\,841\,569}{367\,873\,228\,800} + \frac{255}{16} \beta_s[10, 96], \alpha_s[10, 48] \rightarrow \\
 & \frac{147\,253}{15\,328\,051\,200} + \frac{105}{16} \beta_s[10, 96], \alpha_s[10, 52] \rightarrow \frac{2\,954\,569}{147\,149\,291\,520} + \frac{267}{16} \beta_s[10, 96], \\
 \beta_s[10, 27] & \rightarrow \frac{56\,099}{61\,312\,204\,800} + \frac{45}{16} \beta_s[10, 96], \beta_s[10, 28] \rightarrow \frac{5303}{61\,312\,204\,800} - \frac{61}{32} \beta_s[10, 96], \\
 \alpha_s[10, 51] & \rightarrow -\frac{582\,863}{122\,624\,409\,600} - \frac{119}{32} \beta_s[10, 96], \\
 \alpha_s[10, 54] & \rightarrow -\frac{45\,817}{16\,349\,921\,280} - \frac{61}{32} \beta_s[10, 96], \\
 \beta_s[10, 29] & \rightarrow -\frac{689}{61\,312\,204\,800} - \frac{3}{16} \beta_s[10, 96], \\
 \alpha_s[10, 53] & \rightarrow -\frac{19\,757}{6\,131\,220\,480} - \frac{3}{16} \beta_s[10, 96], \beta_s[10, 30] \rightarrow \frac{10\,859}{8\,360\,755\,200} - \frac{3}{32} \beta_s[10, 96],
 \end{aligned}$$

$$\begin{aligned}
\beta s[10, 31] &\rightarrow \frac{1571}{3\,832\,012\,800}, \beta s[10, 32] \rightarrow -\frac{3047}{955\,514\,880} - \frac{5}{2} \beta s[10, 96], \\
\alpha s[10, 59] &\rightarrow \frac{7\,677\,623}{367\,873\,228\,800} + 17 \beta s[10, 96], \alpha s[10, 93] \rightarrow \frac{1\,031\,363}{45\,984\,153\,600} + 18 \beta s[10, 96], \\
\beta s[10, 33] &\rightarrow \frac{15\,269}{40\,874\,803\,200}, \beta s[10, 34] \rightarrow \frac{2143}{2\,874\,009\,600} + \beta s[10, 96], \\
\alpha s[10, 96] &\rightarrow -\frac{233}{10\,948\,608} - 17 \beta s[10, 96], \alpha s[10, 58] \rightarrow -\frac{119\,033}{16\,721\,510\,400} - \frac{13}{2} \beta s[10, 96], \\
\alpha s[10, 70] &\rightarrow \frac{23}{31\,539\,200}, \beta s[10, 35] \rightarrow -\frac{4723}{1\,437\,004\,800} + \frac{61}{32} \beta s[10, 96], \\
\alpha s[10, 60] &\rightarrow \frac{7\,345\,673}{735\,746\,457\,600} + \frac{61}{8} \beta s[10, 96], \\
\alpha s[10, 79] &\rightarrow -\frac{75\,823}{8\,360\,755\,200} - \frac{251}{32} \beta s[10, 96], \\
\beta s[10, 36] &\rightarrow -\frac{267\,661}{40\,874\,803\,200} - \frac{11}{8} \beta s[10, 96], \\
\alpha s[10, 61] &\rightarrow \frac{101\,681}{40\,874\,803\,200} + \frac{21}{8} \beta s[10, 96], \\
\alpha s[10, 62] &\rightarrow \frac{132\,101}{22\,992\,076\,800} + \frac{209}{32} \beta s[10, 96], \\
\beta s[10, 37] &\rightarrow -\frac{323}{12\,262\,440\,960} - \frac{61}{32} \beta s[10, 96], \\
\alpha s[10, 71] &\rightarrow -\frac{260\,731}{13\,138\,329\,600} - \frac{275}{32} \beta s[10, 96], \\
\alpha s[10, 77] &\rightarrow -\frac{20\,501}{2\,090\,188\,800} - \frac{257}{32} \beta s[10, 96], \\
\beta s[10, 38] &\rightarrow \frac{360\,779}{367\,873\,228\,800} - \frac{17}{32} \beta s[10, 96], \\
\alpha s[10, 64] &\rightarrow \frac{53\,533}{49\,049\,763\,840} + \frac{47}{32} \beta s[10, 96], \beta s[10, 39] \rightarrow \frac{160\,531}{31\,531\,991\,040}, \\
\alpha s[10, 89] &\rightarrow \frac{250\,403}{19\,707\,494\,400} + 8 \beta s[10, 96], \alpha s[10, 65] \rightarrow \frac{3007}{328\,458\,240} + \frac{27}{4} \beta s[10, 96], \\
\alpha s[10, 76] &\rightarrow -\frac{24\,806\,053}{2\,207\,239\,372\,800} - \frac{159}{16} \beta s[10, 96], \\
\alpha s[10, 66] &\rightarrow \frac{1087}{5\,109\,350\,400} - \frac{27}{32} \beta s[10, 96], \\
\alpha s[10, 69] &\rightarrow -\frac{3\,462\,461}{551\,809\,843\,200} - \frac{177}{32} \beta s[10, 96], \\
\beta s[10, 40] &\rightarrow -\frac{32\,339}{26\,276\,659\,200} - \frac{11}{32} \beta s[10, 96], \\
\beta s[10, 41] &\rightarrow \frac{239}{66\,355\,200} + \frac{61}{32} \beta s[10, 96], \alpha s[10, 68] \rightarrow -\frac{9709}{3\,284\,582\,400} - \frac{75}{32} \beta s[10, 96], \\
\beta s[10, 42] &\rightarrow -\frac{3943}{2\,874\,009\,600} - \frac{79}{32} \beta s[10, 96], \\
\beta s[10, 43] &\rightarrow \frac{337\,973}{183\,936\,614\,400} - \frac{61}{16} \beta s[10, 96], \beta s[10, 44] \rightarrow \frac{1}{7\,983\,360} - \frac{5}{2} \beta s[10, 96],
\end{aligned}$$

$$\begin{aligned} \beta_s[10, 45] &\rightarrow -\frac{1\,420\,889}{367\,873\,228\,800} - \frac{61}{32} \beta_s[10, 96], \\ \alpha_s[10, 81] &\rightarrow \frac{19\,669}{5\,748\,019\,200} + \frac{17}{8} \beta_s[10, 96], \alpha_s[10, 82] \rightarrow \frac{112\,943}{11\,496\,038\,400} + \frac{37}{8} \beta_s[10, 96], \\ \alpha_s[10, 74] &\rightarrow -\frac{4\,111\,993}{735\,746\,457\,600} - \frac{33}{8} \beta_s[10, 96], \\ \beta_s[10, 46] &\rightarrow -\frac{1963}{875\,888\,640} - \frac{93}{32} \beta_s[10, 96], \beta_s[10, 47] \rightarrow \frac{33\,857}{13\,624\,934\,400} + 2 \beta_s[10, 96], \\ \beta_s[10, 48] &\rightarrow \frac{48\,911}{15\,328\,051\,200} - \frac{21}{16} \beta_s[10, 96], \beta_s[10, 49] \rightarrow \frac{453\,757}{45\,984\,153\,600} + \frac{51}{32} \beta_s[10, 96], \\ \alpha_s[10, 78] &\rightarrow \frac{467}{185\,794\,560} + \frac{51}{32} \beta_s[10, 96], \beta_s[10, 50] \rightarrow \frac{14\,981}{11\,496\,038\,400} - 2 \beta_s[10, 96], \\ \beta_s[10, 51] &\rightarrow -\frac{12\,077}{30\,656\,102\,400}, \beta_s[10, 52] \rightarrow \frac{91\,027}{20\,437\,401\,600} + \frac{17}{32} \beta_s[10, 96], \\ \beta_s[10, 53] &\rightarrow -\frac{683}{425\,779\,200} + 3 \beta_s[10, 96], \beta_s[10, 54] \rightarrow -\frac{41\,971}{61\,312\,204\,800}, \\ \beta_s[10, 55] &\rightarrow \frac{1811}{718\,502\,400} + 8 \beta_s[10, 96], \beta_s[10, 56] \rightarrow \frac{6571}{22\,992\,076\,800} + \frac{5}{2} \beta_s[10, 96], \\ \beta_s[10, 57] &\rightarrow -\frac{299}{1\,277\,337\,600}, \beta_s[10, 58] \rightarrow \frac{8033}{2\,874\,009\,600} + \frac{29}{32} \beta_s[10, 96], \\ \beta_s[10, 59] &\rightarrow \frac{2\,383\,991}{551\,809\,843\,200} + \frac{17}{32} \beta_s[10, 96], \\ \alpha_s[10, 90] &\rightarrow -\frac{23\,899}{2\,043\,740\,160} - \frac{243}{32} \beta_s[10, 96], \\ \beta_s[10, 60] &\rightarrow \frac{158\,003}{36\,787\,322\,880} + \frac{61}{32} \beta_s[10, 96], \beta_s[10, 61] \rightarrow \frac{313}{319\,334\,400} + \frac{29}{32} \beta_s[10, 96], \\ \beta_s[10, 62] &\rightarrow -\frac{26\,513}{5\,748\,019\,200} - 2 \beta_s[10, 96], \beta_s[10, 63] \rightarrow -\frac{611}{851\,558\,400}, \\ \beta_s[10, 64] &\rightarrow -\frac{678\,851}{183\,936\,614\,400} - \frac{61}{32} \beta_s[10, 96], \\ \beta_s[10, 65] &\rightarrow \frac{809}{143\,700\,480} + 2 \beta_s[10, 96], \beta_s[10, 66] \rightarrow \frac{607}{1\,703\,116\,800} - \frac{7}{16} \beta_s[10, 96], \\ \beta_s[10, 67] &\rightarrow -\frac{41}{9\,580\,032} - 10 \beta_s[10, 96], \beta_s[10, 68] \rightarrow \frac{3101}{1\,459\,814\,400} + \frac{61}{32} \beta_s[10, 96], \\ \beta_s[10, 69] &\rightarrow -\frac{163\,543}{55\,180\,984\,320} - \frac{61}{32} \beta_s[10, 96], \beta_s[10, 70] \rightarrow -\frac{1777}{522\,547\,200} - \frac{7}{2} \beta_s[10, 96], \\ \beta_s[10, 71] &\rightarrow \frac{10\,673}{5\,748\,019\,200} + 15 \beta_s[10, 96], \beta_s[10, 72] \rightarrow -\frac{7549}{1\,277\,337\,600} - \frac{5}{2} \beta_s[10, 96], \\ \beta_s[10, 73] &\rightarrow \frac{1}{2\,052\,864} + 2 \beta_s[10, 96], \beta_s[10, 74] \rightarrow -\frac{120\,259}{61\,312\,204\,800} - \frac{29}{32} \beta_s[10, 96], \\ \beta_s[10, 75] &\rightarrow -\frac{821}{1\,916\,006\,400}, \beta_s[10, 76] \rightarrow -\frac{358\,201}{183\,936\,614\,400} + \frac{17}{32} \beta_s[10, 96], \\ \beta_s[10, 77] &\rightarrow \frac{1549}{547\,430\,400} + \frac{5}{2} \beta_s[10, 96], \beta_s[10, 78] \rightarrow -\frac{1}{2\,395\,008} - \beta_s[10, 96], \\ \beta_s[10, 79] &\rightarrow \frac{6253}{7\,664\,025\,600} + \frac{1}{2} \beta_s[10, 96], \beta_s[10, 80] \rightarrow \frac{2159}{1\,916\,006\,400} + 5 \beta_s[10, 96], \end{aligned}$$

$$\begin{aligned}
 \beta_s[10, 81] &\rightarrow -\frac{145}{76\,640\,256} - \frac{5}{2}\beta_s[10, 96], \beta_s[10, 82] \rightarrow \frac{90\,313}{7\,664\,025\,600} + 3\beta_s[10, 96], \\
 \beta_s[10, 83] &\rightarrow -\frac{389}{718\,502\,400} + 2\beta_s[10, 96], \beta_s[10, 84] \rightarrow \frac{129\,673}{22\,992\,076\,800} + \frac{5}{2}\beta_s[10, 96], \\
 \beta_s[10, 85] &\rightarrow \frac{389}{383\,201\,280}, \beta_s[10, 86] \rightarrow \frac{541}{638\,668\,800}, \beta_s[10, 87] \rightarrow \frac{767}{1\,277\,337\,600}, \\
 \beta_s[10, 88] &\rightarrow \frac{1}{11\,975\,040}, \beta_s[10, 89] \rightarrow \frac{7621}{656\,916\,480} + 5\beta_s[10, 96], \\
 \beta_s[10, 90] &\rightarrow -\frac{4877}{766\,402\,560} - \beta_s[10, 96], \beta_s[10, 91] \rightarrow -\frac{791}{149\,299\,200} - 2\beta_s[10, 96], \\
 \beta_s[10, 92] &\rightarrow -\frac{1217}{153\,280\,512} - 3\beta_s[10, 96], \beta_s[10, 93] \rightarrow \frac{9179}{3\,832\,012\,800} + \beta_s[10, 96], \\
 \beta_s[10, 94] &\rightarrow -\frac{1}{5\,987\,520} - 2\beta_s[10, 96], \beta_s[10, 95] \rightarrow \frac{1}{3\,548\,160}, \beta_s[10, 97] \rightarrow \frac{1}{1\,995\,840}, \\
 \beta_s[10, 98] &\rightarrow \frac{1}{2\,280\,960}, \beta_s[10, 99] \rightarrow -\frac{1}{47\,900\,160}, \gamma_s[10, 1] \rightarrow 0, \\
 \gamma_s[10, 2] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 3] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 4] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 5] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 6] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 7] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 8] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 9] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 10] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 11] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 12] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 13] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 14] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 15] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 16] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 17] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 18] \rightarrow -\frac{1}{383\,201\,280}, \gamma_s[10, 19] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 20] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 21] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 22] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 23] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 24] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 25] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 26] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 27] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 28] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 29] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 30] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 31] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 32] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 33] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 34] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 35] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 36] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 37] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 38] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 39] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 40] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 41] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 42] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 43] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 44] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 45] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 46] \rightarrow -\frac{1}{191\,600\,640},
 \end{aligned}$$

$$\begin{aligned}
 \gamma_s[10, 47] &\rightarrow -\frac{1}{383\,201\,280}, \gamma_s[10, 48] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 49] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 50] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 51] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 52] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 53] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 54] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 55] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 56] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 57] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 58] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 59] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 60] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 61] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 62] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 63] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 64] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 65] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 66] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 67] \rightarrow -\frac{1}{383\,201\,280}, \\
 \gamma_s[10, 68] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 69] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 70] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 71] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 72] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 73] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 74] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 75] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 76] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 77] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 78] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 79] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 80] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 81] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 82] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 83] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 84] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 85] \rightarrow -\frac{1}{383\,201\,280}, \\
 \gamma_s[10, 86] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 87] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 88] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 89] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 90] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 91] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 92] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 93] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 94] \rightarrow -\frac{1}{958\,003\,200}, \\
 \gamma_s[10, 95] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 96] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 97] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 98] &\rightarrow -\frac{1}{383\,201\,280}, \gamma_s[10, 99] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 100] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 101] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 102] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 103] \rightarrow -\frac{1}{191\,600\,640}, \\
 \gamma_s[10, 104] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 105] \rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 106] \rightarrow -\frac{1}{383\,201\,280}, \\
 \gamma_s[10, 107] &\rightarrow -\frac{1}{191\,600\,640}, \gamma_s[10, 108] \rightarrow 0, \kappa_s[10] \rightarrow -\frac{1}{1\,916\,006\,400} \}}
 \end{aligned}$$

$\beta_s[10, 96] = 0$; sol10 /. Rule \rightarrow Set; $\$SeriesShowDegree = 10$; {V, C}

$$\begin{aligned}
 & \{M[\{1 \rightarrow LS[0, -\frac{12}{24}, 0, \frac{71112}{5760} - \frac{71122}{5760} + \frac{1222}{1440}, 0, \\
 & -\frac{31111112}{967680} + \frac{31111122}{483840} - \frac{83111222}{967680} - \frac{31112122}{725760} - \frac{31111212}{645120} + \\
 & \frac{13112222}{241920} + \frac{101121222}{1451520} + \frac{527112212}{5806080} - \frac{122222}{60480}, 0, \\
 & \frac{12711111112}{154828800} - \frac{127111111122}{51609600} + \frac{239911111222}{464486400} + \frac{458911112122}{348364800} + \\
 & \frac{12711111212}{30965760} - \frac{289311112222}{464486400} - \frac{2539911121222}{1393459200} + \frac{578311112212}{696729600} + \\
 & \frac{27111122222}{58060800} + \frac{323911212122}{174182400} + \frac{166111212222}{87091200} + \frac{1911121122}{9289728} - \\
 & \frac{12711112112}{77414400} - \frac{1409911122122}{696729600} - \frac{1648311122212}{1393459200} - \\
 & \frac{193311221222}{348364800} - \frac{73311121212}{23224320} - \frac{1911222222}{9676800} + \frac{62912121222}{12902400} - \\
 & \frac{49312122222}{29030400} + \frac{685711211222}{464486400} - \frac{754911211212}{348364800} + \\
 & \frac{373311122112}{232243200} + \frac{990711212212}{348364800} - \frac{29911222122}{5529600} - \frac{12111222212}{7257600} - \\
 & \frac{4912212222}{1382400} - \frac{12122122}{30720} + \frac{44911221212}{9676800} + \frac{12222222}{241920}, \\
 & 0, -\frac{731111111112}{3503554560} + \frac{7311111111122}{875888640} - \frac{16211111111222}{6812467200} -
 \end{aligned}$$

$\begin{array}{r} \overline{18\,539\,111\,111\,12\,122} \\ 6\,569\,164\,800 \end{array}$	$\begin{array}{r} \overline{511\,111\,111\,112\,12} \\ 2\,335\,703\,040 \end{array}$	$\begin{array}{r} \overline{12\,941\,111\,111\,122\,22} \\ 30\,656\,102\,400 \end{array} +$
$\begin{array}{r} \overline{383\,111\,112\,122\,2} \\ 87\,091\,200 \end{array}$	$\begin{array}{r} \overline{471\,703\,111\,111\,122\,12} \\ 105\,106\,636\,800 \end{array}$	$\begin{array}{r} \overline{2281\,111\,112\,222} \\ 4\,541\,644\,800 \end{array} -$
$\begin{array}{r} \overline{1159\,111\,1212\,122} \\ 82\,114\,560 \end{array}$	$\begin{array}{r} \overline{30\,953\,111\,12122\,22} \\ 7\,357\,464\,576 \end{array}$	$\begin{array}{r} \overline{45\,121\,111\,112\,1122} \\ 35\,035\,545\,600 \end{array} +$
$\begin{array}{r} \overline{73\,111\,112\,112} \\ 350\,355\,456 \end{array} +$	$\begin{array}{r} \overline{65\,459\,111\,122\,122} \\ 6\,569\,164\,800 \end{array} +$	$\begin{array}{r} \overline{6\,461\,969\,111\,112\,212} \\ 735\,746\,457\,600 \end{array} -$
$\begin{array}{r} \overline{2\,119\,787\,111\,122\,122\,2} \\ 367\,873\,228\,800 \end{array} +$	$\begin{array}{r} \overline{617\,777\,111\,112\,1212} \\ 49\,049\,763\,840 \end{array} +$	$\begin{array}{r} \overline{6103\,111\,122\,2222} \\ 15\,328\,051\,200 \end{array} +$
$\begin{array}{r} \overline{96\,577\,111212\,122\,2} \\ 73\,574\,645\,760 \end{array} +$	$\begin{array}{r} \overline{136\,127\,1112\,122\,222} \\ 30\,656\,102\,400 \end{array} -$	$\begin{array}{r} \overline{152\,807\,11\,112\,1122\,2} \\ 81\,749\,606\,400 \end{array} +$
$\begin{array}{r} \overline{4\,751\,993\,11\,112\,112\,12} \\ 735\,746\,457\,600 \end{array} +$	$\begin{array}{r} \overline{34\,229\,111\,112\,112} \\ 35\,035\,545\,600 \end{array} -$	$\begin{array}{r} \overline{35\,347\,11112\,122\,12} \\ 973\,209\,600 \end{array} -$
$\begin{array}{r} \overline{36\,703\,111\,122\,2\,122} \\ 4\,541\,644\,800 \end{array} -$	$\begin{array}{r} \overline{2\,094\,149\,111\,122\,2212} \\ 735\,746\,457\,600 \end{array} +$	$\begin{array}{r} \overline{739\,763\,11\,122\,122\,22} \\ 91\,968\,307\,200 \end{array} +$
$\begin{array}{r} \overline{3937\,1112\,122\,122} \\ 26\,276\,659\,200 \end{array}$	$\begin{array}{r} \overline{21\,706\,621\,111\,122\,1212} \\ 367\,873\,228\,800 \end{array}$	$\begin{array}{r} \overline{59\,11\,122\,22222} \\ 283\,852\,800 \end{array} +$
$\begin{array}{r} \overline{3007\,1121212\,122} \\ 328\,458\,240 \end{array} +$	$\begin{array}{r} \overline{3557\,11212\,122\,22} \\ 766\,402\,560 \end{array} +$	$\begin{array}{r} \overline{23\,112\,122\,122\,2} \\ 31\,539\,200 \end{array} -$

$$\begin{array}{r}
 \overline{48831121222222} - \overline{779691112112122} + \overline{178271112112222} - \\
 1149603840 \quad \quad \quad 8758886400 \quad \quad \quad 49049763840 \\
 \\
 \overline{297672231112112212} + \overline{169271111211122} - \overline{731111121112} - \\
 735746457600 \quad \quad \quad 17517772800 \quad \quad \quad 1401421824 \\
 \\
 \overline{241031111221122} - \overline{2553071111222112} - \overline{447711112211222} + \\
 8758886400 \quad \quad \quad 122624409600 \quad \quad \quad 30656102400 \\
 \\
 \overline{1472531112212122} + \overline{87923691112122212} - \overline{26669991111212112} - \\
 15328051200 \quad \quad \quad 735746457600 \quad \quad \quad 122624409600 \\
 \\
 \overline{197571112221222} - \overline{4282511112222122} - \overline{477011112222212} - \\
 6131220480 \quad \quad \quad 91968307200 \quad \quad \quad 22992076800 \\
 \\
 \overline{70391122122222} - \overline{2607311121222122} + \overline{501111112121122} + \\
 851558400 \quad \quad \quad 13138329600 \quad \quad \quad 13377208320 \\
 \\
 \overline{78415691112212212} + \overline{29545691112221212} - \overline{25011122212222} + \\
 367873228800 \quad \quad \quad 147149291520 \quad \quad \quad 5748019200 \\
 \\
 \overline{3178311112121212} + \overline{51122222222} + \overline{2504031212121222} - \\
 16349921280 \quad \quad \quad 76640256 \quad \quad \quad 19707494400 \\
 \\
 \overline{9040491212122222} - \overline{1052331212212222} - \overline{238991212122122} + \\
 45984153600 \quad \quad \quad 5109350400 \quad \quad \quad 2043740160 \\
 \\
 \overline{100131212222222} + \overline{73456731121121222} - \overline{48311121122222} - \\
 3832012800 \quad \quad \quad 735746457600 \quad \quad \quad 1703116800 \\
 \\
 \overline{1190331121121122} + \overline{1016811121122122} + \overline{1321011121122212} + \\
 16721510400 \quad \quad \quad 40874803200 \quad \quad \quad 22992076800
 \end{array}$$

$$\begin{aligned}
 & \frac{7\ 677\ 623\ \overline{112}\ \overline{112}\ \overline{1212}}{367\ 873\ 228\ 800} + \frac{161\ 587\ 1\ \overline{112}\ \overline{11}\ \overline{122}\ 2}{49\ 049\ 763\ 840} - \frac{34\ 997\ 1\ \overline{112}\ 1\ \overline{112}\ \overline{12}}{7\ 664\ 025\ 600} + \\
 & \frac{2689\ 111\ \overline{122}\ 1\ \overline{112}}{1\ 061\ 683\ 200} + \frac{321\ 179\ 11\ \overline{122}\ \overline{112}\ \overline{12}}{49\ 049\ 763\ 840} + \frac{48\ 227\ 11\ \overline{12}\ \overline{122}\ \overline{112}}{5\ 255\ 331\ 840} - \\
 & \frac{582\ 863\ 11\ \overline{122}\ 21\ \overline{122}}{122\ 624\ 409\ 600} - \frac{45\ 817\ 11\ \overline{122}\ 22\ \overline{112}}{16\ 349\ 921\ 280} - \frac{187\ 391\ 1\ \overline{122}\ 1\ \overline{122}\ 22}{30\ 656\ 102\ 400} - \\
 & \frac{20\ 501\ 1\ \overline{122}\ \overline{12}\ \overline{122}\ 2}{2\ 090\ 188\ 800} - \frac{4\ 111\ 993\ 1\ \overline{122}\ 1\ \overline{122}\ \overline{12}}{735\ 746\ 457\ 600} - \frac{9709\ 11\ \overline{12}\ \overline{122}\ 1\ \overline{122}}{3\ 284\ 582\ 400} + \\
 & \frac{1087\ 11\ \overline{1212}\ \overline{122}\ \overline{12}}{5\ 109\ 350\ 400} - \frac{131\ 413\ 11\ \overline{12}\ \overline{122}\ 22\ \overline{12}}{10\ 218\ 700\ 800} + \frac{17\ 586\ 761\ 11\ \overline{122}\ \overline{12}\ \overline{112}}{735\ 746\ 457\ 600} + \\
 & \frac{19\ 669\ 1\ \overline{122}\ 212\ \overline{122}}{5\ 748\ 019\ 200} - \frac{75\ 823\ 1\ \overline{122}\ \overline{122}\ 212}{8\ 360\ 755\ 200} + \frac{44\ 689\ 1\ \overline{122}\ 22\ \overline{122}\ 2}{2\ 554\ 675\ 200} + \\
 & \frac{101\ 197\ 1\ \overline{122}\ 222\ \overline{122}}{7\ 664\ 025\ 600} + \frac{52\ 807\ 1\ \overline{122}\ 2222\ \overline{12}}{15\ 328\ 051\ 200} - \frac{233\ \overline{122}\ \overline{122}\ \overline{122}\ 2}{10\ 948\ 608} + \\
 & \frac{1679\ \overline{122}\ \overline{122}\ 2222}{191\ 600\ 640} + \frac{1\ 031\ 363\ \overline{12}\ \overline{122}\ 2\ \overline{122}\ 2}{45\ 984\ 153\ 600} + \frac{14\ 647\ \overline{12}\ \overline{122}\ 22\ \overline{122}}{383\ 201\ 280} + \\
 & \frac{53\ 533\ \overline{112}\ \overline{121}\ \overline{122}\ 2}{49\ 049\ 763\ 840} + \frac{1\ 280\ 467\ 1\ \overline{112}\ \overline{112}\ \overline{112}}{367\ 873\ 228\ 800} + \frac{467\ 1\ \overline{122}\ \overline{122}\ \overline{122}}{185\ 794\ 560} - \\
 & \frac{3\ 462\ 461\ 11\ \overline{12}\ \overline{122}\ \overline{1212}}{551\ 809\ 843\ 200} + \frac{112\ 943\ 1\ \overline{122}\ 2\ \overline{122}\ \overline{12}}{11\ 496\ 038\ 400} + \frac{20\ 819\ 1\ \overline{122}\ 22\ \overline{1212}}{8\ 360\ 755\ 200} + \\
 & \left. \frac{16\ 699\ \overline{122}\ 2\ \overline{122}\ 222}{1\ 916\ 006\ 400} - \frac{24\ 806\ 053\ 1\ \overline{122}\ \overline{121212}}{2\ 207\ 239\ 372\ 800} - \frac{\overline{122}\ 2222222}{95\ 800\ 320} \right],
 \end{aligned}$$

$$2 \rightarrow \text{LS} \left[\frac{1}{2}, -\frac{12}{12}, 0, \frac{1\ 112}{5760} - \frac{1}{720} \overline{1122} + \frac{1}{720} \overline{122}\ 2, -\frac{11\ 112}{7680} + \frac{11\ 122}{3840} - \frac{112\ 12}{6912} \right],$$

$$\begin{aligned}
 & \frac{111112}{645120} + \frac{23111122}{483840} - \frac{131112222}{161280} - \frac{112122}{22680} - \\
 & \frac{41111212}{580608} + \frac{112222}{15120} + \frac{121222}{12096} + \frac{71112212}{483840} - \frac{122222}{30240}, \\
 & \frac{1111112}{258048} - \frac{51111122}{387072} + \frac{11112222}{64512} + \frac{11121222}{96768} + \frac{51111212}{290304} - \frac{11122222}{96768} - \\
 & \frac{171121222}{1451520} - \frac{1112212}{60480} - \frac{11211222}{207360} - \frac{71112112}{1658880} + \frac{1122212}{207360}, \\
 & \frac{11111112}{77414400} - \frac{5871111122}{464486400} + \frac{25311111222}{66355200} - \frac{342711112122}{348364800} + \\
 & \frac{92911111212}{55738368} - \frac{43111122222}{7257600} + \frac{29111212222}{24883200} - \frac{469711112212}{99532800} + \\
 & \frac{7311122222}{14515200} + \frac{41112121212}{5443200} - \frac{112122222}{1088640} + \frac{28111121122}{92897280} + \\
 & \frac{79711112112}{232243200} - \frac{11122122}{108864} + \frac{199111122212}{174182400} - \frac{131311221222}{87091200} + \\
 & \frac{27111121212}{30965760} - \frac{11222222}{403200} + \frac{245912121222}{87091200} - \frac{12122222}{172800} + \\
 & \frac{4711211222}{6451200} - \frac{565311211212}{1393459200} + \frac{228111122112}{464486400} + \frac{15111212212}{14515200} - \\
 & \frac{11222122}{92160} - \frac{15111222212}{14515200} - \frac{12212222}{172800} - \frac{39111221212}{17418240} + \frac{12222222}{1209600}, \\
 & \frac{111111112}{9830400} + \frac{43111111122}{88473600} - \frac{91111111222}{88473600} - \frac{131111112122}{1474560} +
 \end{aligned}$$

$$\begin{array}{r}
 \overline{127111111212} + \overline{19111112222} + \overline{389111121222} - \\
 619315200 + 14745600 + 44236800 - \\
 \\
 \overline{14867111112212} - \overline{111122222} - \overline{41111212122} - \overline{111212222} + \\
 928972800 - 1105920 - 5529600 - 102400 + \\
 \\
 \overline{86311112122} + \overline{658911112112} + \overline{17311122122} + \\
 1857945600 + 2786918400 + 22118400 + \\
 \\
 \overline{2228911122212} - \overline{43111221222} + \overline{5865111121212} + \\
 2786918400 - 49766400 + 3344302080 + \\
 \\
 \overline{111222222} - \overline{1217112121222} + \overline{1217112122222} - \overline{5483111211222} + \\
 2764800 - 69672960 + 174182400 - 928972800 + \\
 \\
 \overline{158057111211212} - \overline{4051111122112} - \overline{4979111212212} + \\
 16721510400 - 5573836800 - 418037760 + \\
 \\
 \overline{1217111222122} + \overline{2113111222212} + \overline{112212222} + \overline{112122122} - \\
 49766400 + 348364800 + 61440 + 61440 - \\
 \\
 \overline{79081111221212} - \overline{112112122} + \overline{112112222} + \overline{5112112212} - \\
 2786918400 - 6531840 + 4354560 + 13934592 - \\
 \\
 \overline{127111211122} - \overline{533111121112} + \overline{11111221122} + \\
 557383680 - 5573836800 + 398131200 + \\
 \\
 \overline{143111222112} - \overline{112211222} + \overline{112122212} + \overline{221111212112} - \\
 348364800 - 12441600 + 3483648 + 1672151040 - \\
 \\
 \overline{112221222} - \overline{112222212} - \overline{112121122} + \overline{7112121212} + \\
 24883200 - 8709120 - 13271040 + 238878720 +
 \end{array}$$

$$\begin{array}{r}
 \overline{1111111112} \\
 9809952768
 \end{array}
 +
 \begin{array}{r}
 \overline{1129111111122} \\
 35035545600
 \end{array}
 -
 \begin{array}{r}
 \overline{34747111111222} \\
 245248819200
 \end{array}
 +$$

$$\begin{array}{r}
 \overline{116761111112122} \\
 61312204800
 \end{array}
 -
 \begin{array}{r}
 \overline{1698659111111212} \\
 735746457600
 \end{array}
 +
 \begin{array}{r}
 \overline{33491111112222} \\
 10218700800
 \end{array}
 +$$

$$\begin{array}{r}
 \overline{1111121222} \\
 20528640
 \end{array}
 +
 \begin{array}{r}
 \overline{25271111112212} \\
 3344302080
 \end{array}
 -
 \begin{array}{r}
 \overline{4001111122222} \\
 8758886400
 \end{array}
 -$$

$$\begin{array}{r}
 \overline{69691111212122} \\
 30656102400
 \end{array}
 -
 \begin{array}{r}
 \overline{5351111212222} \\
 919683072
 \end{array}
 -
 \begin{array}{r}
 \overline{18731111121122} \\
 3269984256
 \end{array}
 +$$

$$\begin{array}{r}
 \overline{194479111112112} \\
 122624409600
 \end{array}
 +
 \begin{array}{r}
 \overline{58371111122122} \\
 15328051200
 \end{array}
 -
 \begin{array}{r}
 \overline{44931111122212} \\
 1513881600
 \end{array}
 +$$

$$\begin{array}{r}
 \overline{560991111221222} \\
 61312204800
 \end{array}
 -
 \begin{array}{r}
 \overline{25515731111121212} \\
 735746457600
 \end{array}
 +
 \begin{array}{r}
 \overline{15711111222222} \\
 3832012800
 \end{array}
 -$$

$$\begin{array}{r}
 \overline{323391112121222} \\
 26276659200
 \end{array}
 +
 \begin{array}{r}
 \overline{1112122222} \\
 7983360
 \end{array}
 -
 \begin{array}{r}
 \overline{1104911111211222} \\
 40874803200
 \end{array}
 -$$

$$\begin{array}{r}
 \overline{16062771111211212} \\
 735746457600
 \end{array}
 -
 \begin{array}{r}
 \overline{1280771111122112} \\
 22295347200
 \end{array}
 -
 \begin{array}{r}
 \overline{1034031111212212} \\
 10218700800
 \end{array}
 -$$

$$\begin{array}{r}
 \overline{6891111222122} \\
 61312204800
 \end{array}
 +
 \begin{array}{r}
 \overline{108591111222212} \\
 8360755200
 \end{array}
 +
 \begin{array}{r}
 \overline{149811112212222} \\
 11496038400
 \end{array}
 -$$

$$\begin{array}{r}
 \overline{39431112122122} \\
 2874009600
 \end{array}
 -
 \begin{array}{r}
 \overline{18879471111221212} \\
 183936614400
 \end{array}
 -
 \begin{array}{r}
 \overline{2991112222222} \\
 1277337600
 \end{array}
 +$$

$$\begin{array}{r} \overline{8091121212122} \\ \hline 143700480 \end{array} - \begin{array}{r} \overline{411121212222} \\ \hline 9580032 \end{array} - \begin{array}{r} \overline{17771121221222} \\ \hline 522547200 \end{array} + \begin{array}{r} \overline{1121222222} \\ \hline 2052864 \end{array} -$$

$$\begin{array}{r} \overline{47231112112122} \\ \hline 1437004800 \end{array} - \begin{array}{r} \overline{3231112112222} \\ \hline 12262440960 \end{array} - \begin{array}{r} \overline{2676611112112212} \\ \hline 40874803200 \end{array} +$$

$$\begin{array}{r} \overline{804471111211122} \\ \hline 30656102400 \end{array} + \begin{array}{r} \overline{2704931111121112} \\ \hline 245248819200 \end{array} + \begin{array}{r} \overline{86311112211122} \\ \hline 2554675200 \end{array} +$$

$$\begin{array}{r} \overline{53031111222112} \\ \hline 61312204800 \end{array} - \begin{array}{r} \overline{19631112211222} \\ \hline 875888640 \end{array} + \begin{array}{r} \overline{489111112212122} \\ \hline 15328051200 \end{array} +$$

$$\begin{array}{r} \overline{3379731112122212} \\ \hline 183936614400 \end{array} - \begin{array}{r} \overline{74991111212112} \\ \hline 3832012800 \end{array} - \begin{array}{r} \overline{6831112221222} \\ \hline 425779200 \end{array} +$$

$$\begin{array}{r} \overline{18111112222122} \\ \hline 718502400 \end{array} + \begin{array}{r} \overline{65711112222212} \\ \hline 22992076800 \end{array} + \begin{array}{r} \overline{21591122122222} \\ \hline 1916006400 \end{array} +$$

$$\begin{array}{r} \overline{106731121222122} \\ \hline 5748019200 \end{array} + \begin{array}{r} \overline{3607791112121122} \\ \hline 367873228800 \end{array} + \begin{array}{r} \overline{4537571112212212} \\ \hline 45984153600 \end{array} +$$

$$\begin{array}{r} \overline{910271112221212} \\ \hline 20437401600 \end{array} - \begin{array}{r} \overline{3891122212222} \\ \hline 718502400 \end{array} + \begin{array}{r} \overline{1605311112121212} \\ \hline 31531991040 \end{array} +$$

$$\begin{array}{r} \overline{112222222} \\ \hline 11975040 \end{array} + \begin{array}{r} \overline{7621121212122} \\ \hline 656916480 \end{array} - \begin{array}{r} \overline{791121212222} \\ \hline 149299200 \end{array} -$$

$$\begin{array}{r} \overline{12171212212222} \\ \hline 153280512 \end{array} - \begin{array}{r} \overline{48771212122122} \\ \hline 766402560 \end{array} + \begin{array}{r} \overline{121222222} \\ \hline 3548160 \end{array} +$$

$$\begin{array}{r} \overline{1580031121121222} \\ \hline 36787322880 \end{array} - \begin{array}{r} \overline{6111121122222} \\ \hline 851558400 \end{array} + \begin{array}{r} \overline{80331121121122} \\ \hline 2874009600 \end{array} +$$

$$\frac{313 \overbrace{112} \overbrace{1122} \overbrace{122}}{319334400} - \frac{26513 \overbrace{112} \overbrace{1122} \overbrace{212}}{5748019200} + \frac{2383991 \overbrace{112} \overbrace{112} \overbrace{1212}}{551809843200} +$$

$$\frac{152691 \overbrace{112} \overbrace{11} \overbrace{122} \overbrace{2}}{40874803200} - \frac{30471 \overbrace{112} \overbrace{1112} \overbrace{12}}{955514880} + \frac{9407111 \overbrace{122} \overbrace{1112}}{61312204800} -$$

$$\frac{142088911 \overbrace{122} \overbrace{112} \overbrace{12}}{367873228800} + \frac{23911 \overbrace{122} \overbrace{122} \overbrace{112}}{66355200} - \frac{1207711 \overbrace{122} \overbrace{21} \overbrace{122}}{30656102400} -$$

$$\frac{4197111 \overbrace{122} \overbrace{22} \overbrace{112}}{61312204800} - \frac{8211 \overbrace{122} \overbrace{1122} \overbrace{22}}{1916006400} + \frac{15491 \overbrace{122} \overbrace{12} \overbrace{122} \overbrace{2}}{547430400} -$$

$$\frac{1202591 \overbrace{122} \overbrace{1122} \overbrace{12}}{61312204800} + \frac{3101 \overbrace{112} \overbrace{122} \overbrace{1122}}{1459814400} + \frac{6071 \overbrace{1212} \overbrace{122} \overbrace{12}}{1703116800} -$$

$$\frac{75491 \overbrace{12} \overbrace{122} \overbrace{22} \overbrace{12}}{1277337600} + \frac{3385711 \overbrace{122} \overbrace{12} \overbrace{112}}{13624934400} - \frac{1451 \overbrace{122} \overbrace{212} \overbrace{122}}{76640256} +$$

$$\frac{62531 \overbrace{122} \overbrace{122} \overbrace{212}}{7664025600} + \frac{3891 \overbrace{122} \overbrace{22} \overbrace{122} \overbrace{2}}{383201280} + \frac{5411 \overbrace{122} \overbrace{222} \overbrace{122}}{638668800} +$$

$$\frac{7671 \overbrace{122} \overbrace{2222} \overbrace{12}}{1277337600} + \frac{122 \overbrace{122} \overbrace{2222}}{1995840} + \frac{9179 \overbrace{12} \overbrace{122} \overbrace{2122} \overbrace{2}}{3832012800} - \frac{12 \overbrace{122} \overbrace{22} \overbrace{122}}{5987520} -$$

$$\frac{678851 \overbrace{112} \overbrace{121} \overbrace{122} \overbrace{2}}{183936614400} + \frac{21431 \overbrace{112} \overbrace{112} \overbrace{112}}{2874009600} - \frac{1 \overbrace{122} \overbrace{122} \overbrace{122}}{2395008} -$$

$$\frac{1635431 \overbrace{12} \overbrace{122} \overbrace{1212}}{55180984320} + \frac{903131 \overbrace{122} \overbrace{2122} \overbrace{12}}{7664025600} + \frac{1296731 \overbrace{122} \overbrace{22} \overbrace{1212}}{22992076800} +$$

$$\left. \begin{aligned} &\frac{122 \overbrace{2122} \overbrace{222}}{2280960} - \frac{3582011 \overbrace{122} \overbrace{1212} \overbrace{12}}{183936614400} - \frac{122 \overbrace{2222} \overbrace{222}}{47900160} \end{aligned} \right\},$$

$$\text{CWS} \left[0, -\frac{\overbrace{12}}{48}, 0, \frac{\overbrace{1112}}{2880} + \frac{\overbrace{1122}}{2880} + \frac{\overbrace{1212}}{5760} + \frac{\overbrace{1222}}{2880}, 0, \right.$$

$$\begin{aligned}
 & \frac{\overline{111112}}{120960} - \frac{\overline{111122}}{120960} - \frac{\overline{111212}}{120960} - \frac{\overline{111222}}{120960} - \\
 & \frac{\overline{112112}}{241920} - \frac{\overline{112122}}{120960} - \frac{\overline{112212}}{120960} - \frac{\overline{112222}}{120960} - \\
 & \frac{\overline{121212}}{362880} - \frac{\overline{121222}}{120960} - \frac{\overline{122122}}{241920} - \frac{\overline{122222}}{120960}, 0, \\
 & \frac{\overline{11111112}}{4838400} + \frac{\overline{11111122}}{4838400} + \frac{\overline{11111212}}{4838400} + \frac{\overline{11111222}}{4838400} + \frac{\overline{11112112}}{4838400} + \\
 & \frac{\overline{11112122}}{4838400} + \frac{\overline{11112212}}{4838400} + \frac{\overline{11112222}}{4838400} + \frac{\overline{11121112}}{9676800} + \\
 & \frac{\overline{11121122}}{4838400} + \frac{\overline{11121212}}{4838400} + \frac{\overline{11121222}}{4838400} + \frac{\overline{11122112}}{4838400} + \\
 & \frac{\overline{11122122}}{4838400} + \frac{\overline{11122212}}{4838400} + \frac{\overline{11122222}}{4838400} + \frac{\overline{11211212}}{4838400} + \\
 & \frac{\overline{11211222}}{4838400} + \frac{\overline{11212122}}{4838400} + \frac{\overline{11212212}}{4838400} + \frac{\overline{11212222}}{4838400} + \\
 & \frac{\overline{11221122}}{9676800} + \frac{\overline{11221212}}{4838400} + \frac{\overline{11221222}}{4838400} + \frac{\overline{11222122}}{4838400} + \\
 & \frac{\overline{11222212}}{4838400} + \frac{\overline{11222222}}{4838400} + \frac{\overline{12121212}}{19353600} + \frac{\overline{12121222}}{4838400} + \\
 & \frac{\overline{12122122}}{4838400} + \frac{\overline{12122222}}{4838400} + \frac{\overline{12212222}}{4838400} + \frac{\overline{12221222}}{9676800} + \frac{\overline{12222222}}{4838400}, \\
 & 0, - \frac{\overline{111111112}}{191600640} - \frac{\overline{111111122}}{191600640} - \frac{\overline{111111212}}{191600640} - \frac{\overline{111111222}}{191600640} - \\
 & \frac{\overline{1111112112}}{191600640} - \frac{\overline{1111112122}}{191600640} - \frac{\overline{1111112212}}{191600640} - \\
 & \frac{\overline{1111112222}}{191600640} - \frac{\overline{1111121112}}{191600640} - \frac{\overline{1111121122}}{191600640} - \frac{\overline{1111121212}}{191600640} - \\
 & \frac{\overline{1111121222}}{191600640} - \frac{\overline{1111122112}}{191600640} - \frac{\overline{1111122122}}{191600640} - \frac{\overline{1111122212}}{191600640} - \\
 & \frac{\overline{1111122222}}{191600640} - \frac{\overline{1111211112}}{383201280} - \frac{\overline{1111211122}}{191600640} - \frac{\overline{1111211212}}{191600640} - \\
 & \frac{\overline{1111211222}}{191600640} - \frac{\overline{1111212112}}{191600640} - \frac{\overline{1111212122}}{191600640} - \frac{\overline{1111212212}}{191600640} - \\
 & \frac{\overline{1111212222}}{191600640} - \frac{\overline{1111221112}}{191600640} - \frac{\overline{1111221122}}{191600640} - \frac{\overline{1111221212}}{191600640} - \\
 & \frac{\overline{1111221222}}{191600640} - \frac{\overline{1111222112}}{191600640} - \frac{\overline{1111222122}}{191600640} - \frac{\overline{1111222212}}{191600640} - \\
 & \frac{\overline{1111222222}}{191600640} - \frac{\overline{1112111212}}{191600640} - \frac{\overline{1112111222}}{191600640} - \frac{\overline{1112112112}}{191600640} -
 \end{aligned}$$

$\overline{1112112122}$	$\overline{1112112212}$	$\overline{1112112222}$	$\overline{1112121122}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1112121212}$	$\overline{1112121222}$	$\overline{1112122112}$	$\overline{1112122122}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1112122212}$	$\overline{1112122222}$	$\overline{1112211122}$	$\overline{1112211212}$
191 600 640	191 600 640	383 201 280	191 600 640
$\overline{1112211222}$	$\overline{1112212112}$	$\overline{1112212122}$	$\overline{1112212212}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1112212222}$	$\overline{1112221122}$	$\overline{1112221212}$	$\overline{1112221222}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1112222112}$	$\overline{1112222122}$	$\overline{1112222212}$	$\overline{1112222222}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1121121122}$	$\overline{1121121212}$	$\overline{1121121222}$	$\overline{1121122122}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1121122212}$	$\overline{1121122222}$	$\overline{1121211212}$	$\overline{1121211222}$
191 600 640	191 600 640	383 201 280	191 600 640
$\overline{1121212122}$	$\overline{1121212212}$	$\overline{1121212222}$	$\overline{1121221122}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1121221212}$	$\overline{1121221222}$	$\overline{1121222122}$	$\overline{1121222212}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1121222222}$	$\overline{1122112212}$	$\overline{1122112222}$	$\overline{1122121212}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1122121222}$	$\overline{1122122122}$	$\overline{1122122212}$	$\overline{1122122222}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1122211222}$	$\overline{1122212122}$	$\overline{1122212212}$	$\overline{1122212222}$
383 201 280	191 600 640	191 600 640	191 600 640
$\overline{1122221212}$	$\overline{1122221222}$	$\overline{1122222122}$	$\overline{1122222212}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1122222222}$	$\overline{1212121212}$	$\overline{1212121222}$	$\overline{1212122122}$
191 600 640	958 003 200	191 600 640	191 600 640
$\overline{1212122222}$	$\overline{1212212122}$	$\overline{1212212222}$	$\overline{1212221222}$
191 600 640	383 201 280	191 600 640	191 600 640
$\overline{1212222122}$	$\overline{1212222222}$	$\overline{1221221222}$	$\overline{1221222222}$
191 600 640	191 600 640	191 600 640	191 600 640
$\overline{1222122222}$	$\overline{1222212222}$	$\overline{1222222222}$	
191 600 640	383 201 280	191 600 640	

$M[\{1 \rightarrow LS[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0] \},$

$CWS \left[0, -\frac{11}{96}, 0, \frac{1111}{11520} \right,$

$$0, -\frac{\overline{111111}}{725760}, 0, \frac{\overline{11111111}}{38707200},$$

$$0, -\frac{\overline{1111111111}}{1916006400}]]] }$$

Save["WKOSolution10.m", {as, bs, gs, ks}]

C

M[{1 → LS[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]}],

CWS[0, - $\frac{11}{96}$, 0, $\frac{1111}{11520}$, 0, - $\frac{111111}{725760}$, 0, $\frac{11111111}{38707200}$, 0, - $\frac{1111111111}{1916006400}$]]]

Series[$\frac{1}{4} \text{Log}\left[\frac{e^{x/2} - e^{-x/2}}{x}\right]$, {x, 0, 10}]

$$\frac{x^2}{96} - \frac{x^4}{11520} + \frac{x^6}{725760} - \frac{x^8}{38707200} + \frac{x^{10}}{1916006400} + O[x]^{11}$$

TimeUsed[]

6178.03

VerticalFlipEq[10, V] // Timing

{1360.250720, {0, 0, 0}}

sol11 = Solve[(# == 0) & /@ Union[μCoefficients[{
 HardR4[12, V], TwistEq[11, V], UnitarityEq[11, V], CapEq[11, V, C]
 }]]]

\$Aborted

sol11 /. Rule → Set; \$SeriesShowDegree = 11; {V, C}

C

Save["WKOSolution11.m", {as, bs, gs, ks}]

VerticalFlipEq[11, V]

TimeUsed[] // Timing