In[•]:=
```
$PBWGens
```

Out[•]=
```
{x12, x13, x23, a1, a2}
```

In[•]:=
```
$k = 1; $n = 3;
TTL = Δ_{i→j,k}[U_i[x13]];
TTL = TT_λ@Table[UCF[If[τ[g] === "X", λ, 1] (g^*)_i Δ_{i→j,k}[U_i[g]]], {g, $PBWGens}]
```

Out[•]=

$$
\begin{aligned}
&e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\ \xi 12_i\ U_j[x12]\ U_k[\,]\ +\\
&\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \xi 13_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \lambda\ \xi 12_i\ \xi 23_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[x13]\ U_k[\,]\ +\\
&e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\ \xi 23_i\ U_j[x23]\ U_k[\,]+2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 13_i\ U_j[x12,\ x13]\ U_k[\,]\ -\\
&2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 23_i\ U_j[x12,\ x23]\ U_k[\,]\ +\\
&2\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda^2\hbar\ \xi 12_i\ \xi 13_i\ \xi 23_i\ U_j[x13,\ x13]\ U_k[\,]\ +\\
&2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\ \gamma\in\lambda\hbar\ \xi 13_i\ \xi 23_i\ U_j[x13,\ x23]\ U_k[\,]-2\,e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\in\hbar\ \xi 12_i\ U_j[x12]\ U_k[a1]\ +\\
&\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\ \xi 13_i-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[x13]\ U_k[a1]\ +\\
&\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\ \xi 13_i-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[x13]\ U_k[a2]\ -\\
&2\,e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in\hbar\ \xi 23_i\ U_j[x23]\ U_k[a2]+e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\ \xi 12_i\ U_j[\,]\ U_k[x12]\ +\\
&2\,e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\in\hbar\ \xi 12_i\ U_j[a1]\ U_k[x12]+2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 13_i\ U_j[x13]\ U_k[x12]\ -\\
&2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 23_i\ U_j[x23]\ U_k[x12]\ +\\
&\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \xi 13_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \lambda\ \xi 12_i\ \xi 23_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[\,]\ U_k[x13]\ +\\
&\left(2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\ \xi 13_i+2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[a1]\ U_k[x13]\ +\\
&\left(2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\ \xi 13_i+2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[a2]\ U_k[x13]\ +\\
&2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 13_i\ U_j[x12]\ U_k[x13]\ +\\
&4\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda^2\hbar\ \xi 12_i\ \xi 13_i\ \xi 23_i\ U_j[x13]\ U_k[x13]+2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\ \gamma\in\lambda\hbar\ \xi 13_i\ \xi 23_i\ U_j[x23]\ U_k[x13]\ +\\
&e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\ \xi 23_i\ U_j[\,]\ U_k[x23]+2\,e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in\hbar\ \xi 23_i\ U_j[a2]\ U_k[x23]\ +\\
&\left(4\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\hbar\ \xi 13_i+2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 23_i\right)\ U_j[x12]\ U_k[x23]\ +\\
&2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\ \gamma\in\lambda\hbar\ \xi 13_i\ \xi 23_i\ U_j[x13]\ U_k[x23]+2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 13_i\ U_j[\,]\ U_k[x12,\ x13]\ -\\
&2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda\hbar\ \xi 12_i\ \xi 23_i\ U_j[\,]\ U_k[x12,\ x23]\ +\\
&2\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\ \gamma\in\lambda^2\hbar\ \xi 12_i\ \xi 13_i\ \xi 23_i\ U_j[\,]\ U_k[x13,\ x13]+2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\ \gamma\in\lambda\hbar\ \xi 13_i\ \xi 23_i\ U_j[\,]\ U_k[x13,\ x23]
\end{aligned}
$$

```
In[•]:= mons[-1] = {};
        mons[p_] :=
          mons[p - 1] ⋃ Union@Cases[Coefficient[TTL, ϵ, p], c_. Uj[x___] Uk[y___] :↦ Uj[x] Uk[y], ∞];
        mons /@ {0, 1}
```

```
Out[•]=
{{Uj[x12] Uk[], Uj[x13] Uk[], Uj[x23] Uk[], Uj[] Uk[x12], Uj[] Uk[x13], Uj[] Uk[x23]},
 {Uj[x12] Uk[], Uj[x13] Uk[], Uj[x23] Uk[], Uj[x12, x13] Uk[], Uj[x12, x23] Uk[],
  Uj[x13, x13] Uk[], Uj[x13, x23] Uk[], Uj[x12] Uk[a1], Uj[x13] Uk[a1], Uj[x13] Uk[a2],
  Uj[x23] Uk[a2], Uj[] Uk[x12], Uj[a1] Uk[x12], Uj[x13] Uk[x12], Uj[x23] Uk[x12],
  Uj[] Uk[x13], Uj[a1] Uk[x13], Uj[a2] Uk[x13], Uj[x12] Uk[x13], Uj[x13] Uk[x13],
  Uj[x23] Uk[x13], Uj[] Uk[x23], Uj[a2] Uk[x23], Uj[x12] Uk[x23], Uj[x13] Uk[x23],
  Uj[] Uk[x12, x13], Uj[] Uk[x12, x23], Uj[] Uk[x13, x13], Uj[] Uk[x13, x23]}}
```

```
In[•]:= ffj = Table[
           Sum[ϵ^p f_{p,u_j}[λ], {p, 0, $k}],
           {u, $PBWGens}
          ] /. f_{p_,u_j}[λ] :↦ If[p == 0, (u*)_i, If[τ[u] == "a", 0, f_{p,u_j}[λ]]]
```

```
Out[•]=
{ξ12_i + ϵ f_{1,x12_j}[λ], ξ13_i + ϵ f_{1,x13_j}[λ], ξ23_i + ϵ f_{1,x23_j}[λ], α1_i, α2_i}
```

```
In[•]:= ffk = ffj /. j → k
```

```
Out[•]=
{ξ12_i + ϵ f_{1,x12_k}[λ], ξ13_i + ϵ f_{1,x13_k}[λ], ξ23_i + ϵ f_{1,x23_k}[λ], α1_i, α2_i}
```

```
In[•]:= fs = Flatten[Table[
           f_{p,ℙ_{j,k}[m]},
           {p, 1, $k}, {m, mons[p]}
          ]]
```

```
Out[•]=
{f_{1,x12_j}, f_{1,x13_j}, f_{1,x23_j}, f_{1,x12_j x13_j}, f_{1,x12_j x23_j}, f_{1,x13_j^2}, f_{1,x13_j x23_j}, f_{1,a1_k x12_j}, f_{1,a1_k x13_j}, f_{1,a2_k x13_j},
 f_{1,a2_k x23_j}, f_{1,x12_k}, f_{1,a1_j x12_k}, f_{1,x12_k x13_j}, f_{1,x12_k x23_j}, f_{1,x13_k}, f_{1,a1_j x13_k}, f_{1,a2_j x13_k}, f_{1,x12_j x13_k}, f_{1,x13_j x13_k},
 f_{1,x13_k x23_j}, f_{1,x23_k}, f_{1,a2_j x23_k}, f_{1,x12_j x23_k}, f_{1,x13_j x23_k}, f_{1,x12_k x13_k}, f_{1,x12_k x23_k}, f_{1,x13_k^2}, f_{1,x13_k x23_k}}
```

```
In[•]:= Complement[mons[1], Uj[] (Uk /@ $PBWGens) ⋃ Uk[] (Uj /@ $PBWGens)]
```

```
Out[•]=
{Uj[x12, x13] Uk[], Uj[x12, x23] Uk[], Uj[x13, x13] Uk[], Uj[x13, x23] Uk[],
 Uj[x12] Uk[a1], Uj[x13] Uk[a1], Uj[x13] Uk[a2], Uj[x23] Uk[a2], Uj[a1] Uk[x12],
 Uj[x13] Uk[x12], Uj[x23] Uk[x12], Uj[a1] Uk[x13], Uj[a2] Uk[x13], Uj[x12] Uk[x13],
 Uj[x13] Uk[x13], Uj[x23] Uk[x13], Uj[a2] Uk[x23], Uj[x12] Uk[x23], Uj[x13] Uk[x23],
 Uj[] Uk[x12, x13], Uj[] Uk[x12, x23], Uj[] Uk[x13, x13], Uj[] Uk[x13, x23]}
```

```
In[•]:= gg = Sum[
           ϵ^p f_{p,ℙ_{j,k}[u]}[λ] ℙ_{j,k}[u],
           {p, 0, $k}, {u, Complement[mons[p], U_j[] (U_k /@ $PBWGens) ⋃ U_k[] (U_j /@ $PBWGens)]}
          ]
```

```
Out[•]=
ϵ a1_k x12_j f_{1,a1_k x12_j}[λ] + ϵ a1_j x12_k f_{1,a1_j x12_k}[λ] + ϵ a1_k x13_j f_{1,a1_k x13_j}[λ] +
 ϵ a2_k x13_j f_{1,a2_k x13_j}[λ] + ϵ x12_j x13_j f_{1,x12_j x13_j}[λ] + ϵ x12_k x13_j f_{1,x12_k x13_j}[λ] +
 ϵ x13_j^2 f_{1,x13_j^2}[λ] + ϵ a1_j x13_k f_{1,a1_j x13_k}[λ] + ϵ a2_j x13_k f_{1,a2_j x13_k}[λ] + ϵ x12_j x13_k f_{1,x12_j x13_k}[λ] +
 ϵ x12_k x13_k f_{1,x12_k x13_k}[λ] + ϵ x13_j x13_k f_{1,x13_j x13_k}[λ] + ϵ x13_k^2 f_{1,x13_k^2}[λ] + ϵ a2_k x23_j f_{1,a2_k x23_j}[λ] +
 ϵ x12_j x23_j f_{1,x12_j x23_j}[λ] + ϵ x12_k x23_j f_{1,x12_k x23_j}[λ] + ϵ x13_j x23_j f_{1,x13_j x23_j}[λ] +
 ϵ x13_k x23_j f_{1,x13_k x23_j}[λ] + ϵ a2_j x23_k f_{1,a2_j x23_k}[λ] + ϵ x12_j x23_k f_{1,x12_j x23_k}[λ] +
 ϵ x12_k x23_k f_{1,x12_k x23_k}[λ] + ϵ x13_j x23_k f_{1,x13_j x23_k}[λ] + ϵ x13_k x23_k f_{1,x13_k x23_k}[λ]
```

```
In[•]:= G = Series[e^gg, {ϵ, 0, $k}]
```

```
Out[•]=
1 + (a1_k x12_j f_{1,a1_k x12_j}[λ] + a1_j x12_k f_{1,a1_j x12_k}[λ] + a1_k x13_j f_{1,a1_k x13_j}[λ] + a2_k x13_j f_{1,a2_k x13_j}[λ] +
     x12_j x13_j f_{1,x12_j x13_j}[λ] + x12_k x13_j f_{1,x12_k x13_j}[λ] + x13_j^2 f_{1,x13_j^2}[λ] + a1_j x13_k f_{1,a1_j x13_k}[λ] +
     a2_j x13_k f_{1,a2_j x13_k}[λ] + x12_j x13_k f_{1,x12_j x13_k}[λ] + x12_k x13_k f_{1,x12_k x13_k}[λ] + x13_j x13_k f_{1,x13_j x13_k}[λ] +
     x13_k^2 f_{1,x13_k^2}[λ] + a2_k x23_j f_{1,a2_k x23_j}[λ] + x12_j x23_j f_{1,x12_j x23_j}[λ] + x12_k x23_j f_{1,x12_k x23_j}[λ] +
     x13_j x23_j f_{1,x13_j x23_j}[λ] + x13_k x23_j f_{1,x13_k x23_j}[λ] + a2_j x23_k f_{1,a2_j x23_k}[λ] + x12_j x23_k f_{1,x12_j x23_k}[λ] +
     x12_k x23_k f_{1,x12_k x23_k}[λ] + x13_j x23_k f_{1,x13_j x23_k}[λ] + x13_k x23_k f_{1,x13_k x23_k}[λ]) ϵ + O[ϵ]^2
```

```
In[•]:= S[B_] := UCF[SS@O_{j,k}[Seepage_{j,k}[ffj, ffk, SS@UCF@B]]];
```

In[•]:= $\mathcal{SG}$ = ES["$\mathcal{SG}$"]@PP"$\mathcal{SG}$"@$\mathcal{S}$[G]

» $\mathcal{SG}$ $U_j[\,]\,U_k[\,]$ + <<22>> + $U_j[\,]\,U_k[x13,\,x23]\left(e^{-\frac{3\gamma\alpha2_i}{2}}\in\xi23_i\,f_{1,x12_k\,x23_k}[\lambda]+e^{-\frac{3\gamma\alpha2_i}{2}}\in f_{1,x13_k\,x23_k}[\lambda]\right)$

Out[•]=

$$
\begin{aligned}
&U_j[\,]\,U_k[\,]+e^{-\frac{1}{2}\gamma(2\alpha1_i-\alpha2_i)}\in U_j[x12]\,U_k[a1]\,f_{1,a1_k\,x12_j}[\lambda]+e^{-\frac{1}{2}\gamma(2\alpha1_i-\alpha2_i)}\in U_j[a1]\,U_k[x12]\,f_{1,a1_j\,x12_k}[\lambda]+\\
&U_j[x13]\,U_k[a1]\left(e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in\xi23_i\,f_{1,a1_k\,x12_j}[\lambda]+e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in f_{1,a1_k\,x13_j}[\lambda]\right)+\\
&e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in U_j[x13]\,U_k[a2]\,f_{1,a2_k\,x13_j}[\lambda]+\\
&e^{-\frac{3\gamma\alpha1_i}{2}}\in U_j[x12,\,x13]\,U_k[\,]\,f_{1,x12_j\,x13_j}[\lambda]+e^{-\frac{3\gamma\alpha1_i}{2}}\in U_j[x13]\,U_k[x12]\,f_{1,x12_k\,x13_j}[\lambda]+\\
&U_j[x13,\,x13]\,U_k[\,]\left(e^{-\gamma(\alpha1_i+\alpha2_i)}\in\xi23_i\,f_{1,x12_j\,x13_j}[\lambda]+e^{-\gamma(\alpha1_i+\alpha2_i)}\in f_{1,x13_j^2}[\lambda]\right)+\\
&U_j[a1]\,U_k[x13]\left(e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in\xi23_i\,f_{1,a1_j\,x12_k}[\lambda]+e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in f_{1,a1_j\,x13_k}[\lambda]\right)+\\
&e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in U_j[a2]\,U_k[x13]\,f_{1,a2_j\,x13_k}[\lambda]+e^{-\frac{3\gamma\alpha1_i}{2}}\in U_j[x12]\,U_k[x13]\,f_{1,x12_j\,x13_k}[\lambda]+\\
&e^{-\frac{3\gamma\alpha1_i}{2}}\in U_j[\,]\,U_k[x12,\,x13]\,f_{1,x12_k\,x13_k}[\lambda]+U_j[x13]\,U_k[x13]\\
&\quad\left(e^{-\gamma(\alpha1_i+\alpha2_i)}\in\xi23_i\,f_{1,x12_k\,x13_j}[\lambda]+e^{-\gamma(\alpha1_i+\alpha2_i)}\in\xi23_i\,f_{1,x12_j\,x13_k}[\lambda]+e^{-\gamma(\alpha1_i+\alpha2_i)}\in f_{1,x13_j\,x13_k}[\lambda]\right)+\\
&U_j[\,]\,U_k[x13,\,x13]\left(e^{-\gamma(\alpha1_i+\alpha2_i)}\in\xi23_i\,f_{1,x12_k\,x13_k}[\lambda]+e^{-\gamma(\alpha1_i+\alpha2_i)}\in f_{1,x13_k^2}[\lambda]\right)+\\
&e^{\frac{1}{2}\gamma(\alpha1_i-2\alpha2_i)}\in U_j[x23]\,U_k[a2]\,f_{1,a2_k\,x23_j}[\lambda]+e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in U_j[x12,\,x23]\,U_k[\,]\,f_{1,x12_j\,x23_j}[\lambda]+\\
&e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in U_j[x23]\,U_k[x12]\,f_{1,x12_k\,x23_j}[\lambda]+\\
&U_j[x13,\,x23]\,U_k[\,]\left(e^{-\frac{3\gamma\alpha2_i}{2}}\in\xi23_i\,f_{1,x12_j\,x23_j}[\lambda]+e^{-\frac{3\gamma\alpha2_i}{2}}\in f_{1,x13_j\,x23_j}[\lambda]\right)+\\
&U_j[x23]\,U_k[x13]\left(e^{-\frac{3\gamma\alpha2_i}{2}}\in\xi23_i\,f_{1,x12_k\,x23_j}[\lambda]+e^{-\frac{3\gamma\alpha2_i}{2}}\in f_{1,x13_k\,x23_j}[\lambda]\right)+\\
&e^{\frac{1}{2}\gamma(\alpha1_i-2\alpha2_i)}\in U_j[a2]\,U_k[x23]\,f_{1,a2_j\,x23_k}[\lambda]+e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in U_j[x12]\,U_k[x23]\,f_{1,x12_j\,x23_k}[\lambda]+\\
&e^{-\frac{1}{2}\gamma(\alpha1_i+\alpha2_i)}\in U_j[\,]\,U_k[x12,\,x23]\,f_{1,x12_k\,x23_k}[\lambda]+\\
&U_j[x13]\,U_k[x23]\left(e^{-\frac{3\gamma\alpha2_i}{2}}\in\xi23_i\,f_{1,x12_j\,x23_k}[\lambda]+e^{-\frac{3\gamma\alpha2_i}{2}}\in f_{1,x13_j\,x23_k}[\lambda]\right)+\\
&U_j[\,]\,U_k[x13,\,x23]\left(e^{-\frac{3\gamma\alpha2_i}{2}}\in\xi23_i\,f_{1,x12_k\,x23_k}[\lambda]+e^{-\frac{3\gamma\alpha2_i}{2}}\in f_{1,x13_k\,x23_k}[\lambda]\right)
\end{aligned}
$$

In[•]:=
```
TTR = ES["TTR"] @
  PP"TTR" @UCF[Invert_{j,k}[𝒮G] ⊠ 𝒮[(∂_λ (ffj.(#_j & /@ $PBWGens) + ffk.(#_k & /@ $PBWGens)) G + ∂_λ G)]]
```

» TTR $e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in U_j[x12]\,U_k[]\,f_{1,x12_j}'[\lambda] +$
<<27>> $+ U_j[]\,U_k[x13,\,x23]\left(e^{-\frac{3\gamma\alpha 2_i}{2}} \in \xi 23_i\, f_{1,\ll 1\gg}'[\lambda] + e^{-\frac{\ll 1\gg}{2}} \in f_{\ll 1\gg}'[\lambda]\right)$

Out[•]=

$$
\begin{aligned}
&e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in U_j[x12]\,U_k[]\,f_{1,x12_j}'[\lambda] + e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in U_j[x12]\,U_k[a1]\,f_{1,a1_k\,x12_j}'[\lambda] +\\
&e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in U_j[]\,U_k[x12]\,f_{1,x12_k}'[\lambda] + e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in U_j[a1]\,U_k[x12]\,f_{1,a1_j\,x12_k}'[\lambda] +\\
&U_j[x13]\,U_k[]\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,x12_j}'[\lambda] + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,x13_j}'[\lambda]\right) +\\
&U_j[x13]\,U_k[a1]\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,a1_k\,x12_j}'[\lambda] + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,a1_k\,x13_j}'[\lambda]\right) +\\
&e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in U_j[x13]\,U_k[a2]\,f_{1,a2_k\,x13_j}'[\lambda] +\\
&e^{-\frac{3\gamma\alpha 1_i}{2}} \in U_j[x12,\,x13]\,U_k[]\,f_{1,x12_j\,x13_j}'[\lambda] + e^{-\frac{3\gamma\alpha 1_i}{2}} \in U_j[x13]\,U_k[x12]\,f_{1,x12_k\,x13_j}'[\lambda] +\\
&U_j[x13,\,x13]\,U_k[]\left(e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,x12_j\,x13_j}'[\lambda] + e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,x13_j^2}'[\lambda]\right) +\\
&U_j[]\,U_k[x13]\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,x12_k}'[\lambda] + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,x13_k}'[\lambda]\right) +\\
&U_j[a1]\,U_k[x13]\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,a1_j\,x12_k}'[\lambda] + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,a1_j\,x13_k}'[\lambda]\right) +\\
&e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in U_j[a2]\,U_k[x13]\,f_{1,a2_j\,x13_k}'[\lambda] + e^{-\frac{3\gamma\alpha 1_i}{2}} \in U_j[x12]\,U_k[x13]\,f_{1,x12_j\,x13_k}'[\lambda] +\\
&e^{-\frac{3\gamma\alpha 1_i}{2}} \in U_j[]\,U_k[x12,\,x13]\,f_{1,x12_k\,x13_k}'[\lambda] + U_j[x13]\,U_k[x13]\\
&\quad\left(e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,x12_k\,x13_j}'[\lambda] + e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,x12_j\,x13_k}'[\lambda] + e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,x13_j\,x13_k}'[\lambda]\right) +\\
&U_j[]\,U_k[x13,\,x13]\left(e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in \xi 23_i\, f_{1,x12_k\,x13_k}'[\lambda] + e^{-\gamma(\alpha 1_i+\alpha 2_i)} \in f_{1,x13_k^2}'[\lambda]\right) +\\
&e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)} \in U_j[x23]\,U_k[]\,f_{1,x23_j}'[\lambda] + e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)} \in U_j[x23]\,U_k[a2]\,f_{1,a2_k\,x23_j}'[\lambda] +\\
&e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in U_j[x12,\,x23]\,U_k[]\,f_{1,x12_j\,x23_j}'[\lambda] + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in U_j[x23]\,U_k[x12]\,f_{1,x12_k\,x23_j}'[\lambda] +\\
&U_j[x13,\,x23]\,U_k[]\left(e^{-\frac{3\gamma\alpha 2_i}{2}} \in \xi 23_i\, f_{1,x12_j\,x23_j}'[\lambda] + e^{-\frac{3\gamma\alpha 2_i}{2}} \in f_{1,x13_j\,x23_j}'[\lambda]\right) +\\
&U_j[x23]\,U_k[x13]\left(e^{-\frac{3\gamma\alpha 2_i}{2}} \in \xi 23_i\, f_{1,x12_k\,x23_j}'[\lambda] + e^{-\frac{3\gamma\alpha 2_i}{2}} \in f_{1,x13_k\,x23_j}'[\lambda]\right) +\\
&e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)} \in U_j[]\,U_k[x23]\,f_{1,x23_k}'[\lambda] + e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)} \in U_j[a2]\,U_k[x23]\,f_{1,a2_j\,x23_k}'[\lambda] +\\
&e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in U_j[x12]\,U_k[x23]\,f_{1,x12_j\,x23_k}'[\lambda] + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)} \in U_j[]\,U_k[x12,\,x23]\,f_{1,x12_k\,x23_k}'[\lambda] +\\
&U_j[x13]\,U_k[x23]\left(e^{-\frac{3\gamma\alpha 2_i}{2}} \in \xi 23_i\, f_{1,x12_j\,x23_k}'[\lambda] + e^{-\frac{3\gamma\alpha 2_i}{2}} \in f_{1,x13_j\,x23_k}'[\lambda]\right) +\\
&U_j[]\,U_k[x13,\,x23]\left(e^{-\frac{3\gamma\alpha 2_i}{2}} \in \xi 23_i\, f_{1,x12_k\,x23_k}'[\lambda] + e^{-\frac{3\gamma\alpha 2_i}{2}} \in f_{1,x13_k\,x23_k}'[\lambda]\right)
\end{aligned}
$$

In[•]:=
```
diff = UCF[TTL - TTR]
```

Out[•]=

$$
\begin{aligned}
&U_j[x12]\,U_k[]\left(e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,\xi 12_i - e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in f_{1,x12_j}'[\lambda]\right) +\\
&U_j[x12]\,U_k[a1]\left(-2\,e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in \hbar\,\xi 12_i - e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in f_{1,a1_k\,x12_j}'[\lambda]\right) +\\
&U_j[]\,U_k[x12]\left(e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,\xi 12_i - e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)} \in f_{1,x12_k}'[\lambda]\right) +
\end{aligned}
$$

$$U_j[a1]\,U_k[x12]\left(2\,e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\in\hbar\,\xi 12_i-e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\in f_{1,a1_j\,x12_k}'[\lambda]\right)+$$

$$U_j[x13]\,U_k[]\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 13_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\xi 12_i\,\xi 23_i+\right.$$
$$\left.e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,x12_j}'[\lambda]-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x13_j}'[\lambda]\right)+$$

$$U_j[x13]\,U_k[a1]\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\,\xi 13_i-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-\right.$$
$$\left.e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,a1_k\,x12_j}'[\lambda]-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,a1_k\,x13_j}'[\lambda]\right)+U_j[x13]\,U_k[a2]$$
$$\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\,\xi 13_i-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,a2_k\,x13_j}'[\lambda]\right)+$$

$$U_j[x12,\,x13]\,U_k[]\left(2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 13_i-e^{-\frac{3\gamma\alpha 1_i}{2}}\in f_{1,x12_j\,x13_j}'[\lambda]\right)+$$

$$U_j[x13]\,U_k[x12]\left(2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 13_i-e^{-\frac{3\gamma\alpha 1_i}{2}}\in f_{1,x12_k\,x13_j}'[\lambda]\right)+U_j[x13,\,x13]\,U_k[]$$
$$\left(2\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda^2\,\hbar\,\xi 12_i\,\xi 13_i\,\xi 23_i-e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,x12_j\,x13_j}'[\lambda]-e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x13_j^2}'[\lambda]\right)+$$

$$U_j[]\,U_k[x13]\left(e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 13_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\xi 12_i\,\xi 23_i+e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-\right.$$
$$\left.e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,x12_k}'[\lambda]-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x13_k}'[\lambda]\right)+$$

$$U_j[a1]\,U_k[x13]\left(2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\,\xi 13_i+2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-\right.$$
$$\left.e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,a1_j\,x12_k}'[\lambda]-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,a1_j\,x13_k}'[\lambda]\right)+U_j[a2]\,U_k[x13]$$
$$\left(2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\hbar\,\xi 13_i+2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,a2_j\,x13_k}'[\lambda]\right)+$$

$$U_j[x12]\,U_k[x13]\left(2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 13_i-e^{-\frac{3\gamma\alpha 1_i}{2}}\in f_{1,x12_j\,x13_k}'[\lambda]\right)+$$

$$U_j[]\,U_k[x12,\,x13]\left(2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 13_i-e^{-\frac{3\gamma\alpha 1_i}{2}}\in f_{1,x12_k\,x13_k}'[\lambda]\right)+$$

$$U_j[x13]\,U_k[x13]\left(4\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda^2\,\hbar\,\xi 12_i\,\xi 13_i\,\xi 23_i-e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,x12_k\,x13_j}'[\lambda]-\right.$$
$$\left.e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,x12_j\,x13_k}'[\lambda]-e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x13_j\,x13_k}'[\lambda]\right)+U_j[]\,U_k[x13,\,x13]$$
$$\left(2\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda^2\,\hbar\,\xi 12_i\,\xi 13_i\,\xi 23_i-e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in\xi 23_i\,f_{1,x12_k\,x13_k}'[\lambda]-e^{-\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x13_k^2}'[\lambda]\right)+$$

$$U_j[x23]\,U_k[]\left(e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,\xi 23_i-e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in f_{1,x23_j}'[\lambda]\right)+$$

$$U_j[x23]\,U_k[a2]\left(-2\,e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in\hbar\,\xi 23_i-e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in f_{1,a2_k\,x23_j}'[\lambda]\right)+$$

$$U_j[x12,\,x23]\,U_k[]\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x12_j\,x23_j}'[\lambda]\right)+$$

$$U_j[x23]\,U_k[x12]\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda\,\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x12_k\,x23_j}'[\lambda]\right)+$$

$$U_j[x13,\,x23]\,U_k[]\left(2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\in\lambda\,\hbar\,\xi 13_i\,\xi 23_i-e^{-\frac{3\gamma\alpha 2_i}{2}}\in\xi 23_i\,f_{1,x12_j\,x23_j}'[\lambda]-e^{-\frac{3\gamma\alpha 2_i}{2}}\in f_{1,x13_j\,x23_j}'[\lambda]\right)+$$

$$U_j[x23]\,U_k[x13]\left(2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\in\lambda\,\hbar\,\xi 13_i\,\xi 23_i-e^{-\frac{3\gamma\alpha 2_i}{2}}\in\xi 23_i\,f_{1,x12_k\,x23_j}'[\lambda]-e^{-\frac{3\gamma\alpha 2_i}{2}}\in f_{1,x13_k\,x23_j}'[\lambda]\right)+$$

$$U_j[]\,U_k[x23]\left(e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,\xi 23_i-e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in f_{1,x23_k}'[\lambda]\right)+$$

$$U_j[a2]\,U_k[x23]\left(2\,e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in\hbar\,\xi 23_i-e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\in f_{1,a2_j\,x23_k}'[\lambda]\right)+U_j[x12]\,U_k[x23]$$

$$\left(4\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\hbar\,\xi 13_i+2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x12_j\,x23_k}'[\lambda]\right)+$$
$$U_j[\,]\,U_k[x12,\,x23]\left(-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\in\lambda\hbar\,\xi 12_i\,\xi 23_i-e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\in f_{1,x12_k\,x23_k}'[\lambda]\right)+$$
$$U_j[x13]\,U_k[x23]\left(2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\in\lambda\hbar\,\xi 13_i\,\xi 23_i-e^{-\frac{3\gamma\alpha 2_i}{2}}\in\xi 23_i\,f_{1,x12_j\,x23_k}'[\lambda]-e^{-\frac{3\gamma\alpha 2_i}{2}}\in f_{1,x13_j\,x23_k}'[\lambda]\right)+$$
$$U_j[\,]\,U_k[x13,\,x23]\left(2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\in\lambda\hbar\,\xi 13_i\,\xi 23_i-e^{-\frac{3\gamma\alpha 2_i}{2}}\in\xi 23_i\,f_{1,x12_k\,x23_k}'[\lambda]-e^{-\frac{3\gamma\alpha 2_i}{2}}\in f_{1,x13_k\,x23_k}'[\lambda]\right)$$

In[•]:= **fs**

Out[•]=

$$\{f_{1,x12_j},\,f_{1,x13_j},\,f_{1,x23_j},\,f_{1,x12_j\,x13_j},\,f_{1,x12_j\,x23_j},\,f_{1,x13_j^2},\,f_{1,x13_j\,x23_j},\,f_{1,a1_k\,x12_j},\,f_{1,a1_k\,x13_j},\,f_{1,a2_k\,x13_j},$$
$$f_{1,a2_k\,x23_j},\,f_{1,x12_k},\,f_{1,a1_j\,x12_k},\,f_{1,x12_k\,x13_j},\,f_{1,x12_k\,x23_j},\,f_{1,x13_k},\,f_{1,a1_j\,x13_k},\,f_{1,a2_j\,x13_k},\,f_{1,x12_j\,x13_k},\,f_{1,x13_j\,x13_k},$$
$$f_{1,x13_k\,x23_j},\,f_{1,x23_k},\,f_{1,a2_j\,x23_k},\,f_{1,x12_j\,x23_k},\,f_{1,x13_j\,x23_k},\,f_{1,x12_k\,x13_k},\,f_{1,x12_k\,x23_k},\,f_{1,x13_k^2},\,f_{1,x13_k\,x23_k}\}$$

```
In[•]:= eqns = Flatten[Table[
           Coefficient[Coefficient[diff, m], ϵ, p] == 0,
           {p, 0, $k}, {m, mons[p]}
          ]]
```

Out[•]=

$$\Big\{ e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,\xi 12_i == 0,\ e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 13_i + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\xi 12_i\,\xi 23_i == 0,$$
$$e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,\xi 23_i == 0,\ e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,\xi 12_i == 0,\ e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 13_i + e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\xi 12_i\,\xi 23_i == 0,$$
$$e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,\xi 23_i == 0,\ -e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,f_{1,x12_j}'[\lambda] == 0,$$
$$e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,x12_j}'[\lambda] - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x13_j}'[\lambda] == 0,$$
$$-e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,f_{1,x23_j}'[\lambda] == 0,\ 2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 13_i - e^{-\frac{3\gamma\alpha 1_i}{2}}\,f_{1,x12_j\,x13_j}'[\lambda] == 0,$$
$$-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x12_j\,x23_j}'[\lambda] == 0,$$
$$2\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda^2\,\hbar\,\xi 12_i\,\xi 13_i\,\xi 23_i - e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,x12_j\,x13_j}'[\lambda] - e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x13_j^2}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 13_i\,\xi 23_i - e^{-\frac{3\gamma\alpha 2_i}{2}}\,\xi 23_i\,f_{1,x12_j\,x23_j}'[\lambda] - e^{-\frac{3\gamma\alpha 2_i}{2}}\,f_{1,x13_j\,x23_j}'[\lambda] == 0,$$
$$-2\,e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,\hbar\,\xi 12_i - e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,f_{1,a1_k\,x12_j}'[\lambda] == 0,\ -2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\hbar\,\xi 13_i -$$
$$2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,a1_k\,x12_j}'[\lambda] - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,a1_k\,x13_j}'[\lambda] == 0,$$
$$-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\hbar\,\xi 13_i - 2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,a2_k\,x13_j}'[\lambda] == 0,$$
$$-2\,e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,\hbar\,\xi 23_i - e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,f_{1,a2_k\,x23_j}'[\lambda] == 0,\ -e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,f_{1,x12_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,\hbar\,\xi 12_i - e^{-\frac{1}{2}\gamma(2\alpha 1_i-\alpha 2_i)}\,f_{1,a1_j\,x12_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 13_i - e^{-\frac{3\gamma\alpha 1_i}{2}}\,f_{1,x12_k\,x13_j}'[\lambda] == 0,$$
$$-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x12_k\,x23_j}'[\lambda] == 0,$$
$$e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,x12_k}'[\lambda] - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x13_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\hbar\,\xi 13_i + 2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i -$$
$$e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,a1_j\,x12_k}'[\lambda] - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,a1_j\,x13_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\hbar\,\xi 13_i + 2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,a2_j\,x13_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 13_i - e^{-\frac{3\gamma\alpha 1_i}{2}}\,f_{1,x12_j\,x13_k}'[\lambda] == 0,\ 4\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda^2\,\hbar\,\xi 12_i\,\xi 13_i\,\xi 23_i -$$
$$e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,x12_k\,x13_j}'[\lambda] - e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,x12_j\,x13_k}'[\lambda] - e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x13_j\,x13_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 13_i\,\xi 23_i - e^{-\frac{3\gamma\alpha 2_i}{2}}\,\xi 23_i\,f_{1,x12_k\,x23_j}'[\lambda] - e^{-\frac{3\gamma\alpha 2_i}{2}}\,f_{1,x13_k\,x23_j}'[\lambda] == 0,$$
$$-e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,f_{1,x23_k}'[\lambda] == 0,\ 2\,e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,\hbar\,\xi 23_i - e^{\frac{1}{2}\gamma(\alpha 1_i-2\alpha 2_i)}\,f_{1,a2_j\,x23_k}'[\lambda] == 0,$$
$$4\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\hbar\,\xi 13_i + 2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x12_j\,x23_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 13_i\,\xi 23_i - e^{-\frac{3\gamma\alpha 2_i}{2}}\,\xi 23_i\,f_{1,x12_j\,x23_k}'[\lambda] - e^{-\frac{3\gamma\alpha 2_i}{2}}\,f_{1,x13_j\,x23_k}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 1_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 13_i - e^{-\frac{3\gamma\alpha 1_i}{2}}\,f_{1,x12_k\,x13_k}'[\lambda] == 0,$$
$$-2\,e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda\,\hbar\,\xi 12_i\,\xi 23_i - e^{-\frac{1}{2}\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x12_k\,x23_k}'[\lambda] == 0,$$
$$2\,e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\gamma\,\lambda^2\,\hbar\,\xi 12_i\,\xi 13_i\,\xi 23_i - e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,\xi 23_i\,f_{1,x12_k\,x13_k}'[\lambda] - e^{-\gamma(\alpha 1_i+\alpha 2_i)}\,f_{1,x13_k^2}'[\lambda] == 0,$$
$$2\,e^{-\frac{3\gamma\alpha 2_i}{2}}\,\gamma\,\lambda\,\hbar\,\xi 13_i\,\xi 23_i - e^{-\frac{3\gamma\alpha 2_i}{2}}\,\xi 23_i\,f_{1,x12_k\,x23_k}'[\lambda] - e^{-\frac{3\gamma\alpha 2_i}{2}}\,f_{1,x13_k\,x23_k}'[\lambda] == 0\Big\}$$

In[•]:=
```
Count[#, Alternatives @@ nfs, ∞, Heads → True] & /@ eqns
```
Out[•]=
```
{3, 3, 7, 1, 1, 7, 1, 1, 1}
```

In[•]:=
```
inits = (#[0] == 0) & /@ fs
```
Out[•]=
$$\left\{f_{0,x13_j}[0]==0,\ f_{0,x13_k}[0]==0,\ f_{1,x13_j}[0]==0,\ f_{1,a1_k\,x13_j}[0]==0,\right.$$
$$\left.f_{1,a2_k\,x13_j}[0]==0,\ f_{1,x13_k}[0]==0,\ f_{1,a1_j\,x13_k}[0]==0,\ f_{1,a2_j\,x13_k}[0]==0,\ f_{1,x12_j\,x23_k}[0]==0\right\}$$

In[•]:=
```
ss = TriangularDSolve[eqns, inits, fs, λ, CF]
```
Out[•]=
```
$Aborted
```

In[•]:=
```
𝔼[Total[fs] /. f_{p_,u_} :> ϵ^p u (f_{p,u} /. ss)[λ]] /. λ | ħ | γ → 1
```
Out[•]=
$$\mathbb{E}[x12_j\,\xi12_i - 2\epsilon\,a1_k\,x12_j\,\xi12_i + x12_k\,\xi12_i + 2\epsilon\,a1_j\,x12_k\,\xi12_i +$$
$$x13_j\,\xi13_i - 2\epsilon\,a1_k\,x13_j\,\xi13_i - 2\epsilon\,a2_k\,x13_j\,\xi13_i + x13_k\,\xi13_i + 2\epsilon\,a1_j\,x13_k\,\xi13_i +$$
$$2\epsilon\,a2_j\,x13_k\,\xi13_i + \epsilon\,x12_k\,x13_j\,\xi12_i\,\xi13_i - \epsilon\,x12_j\,x13_k\,\xi12_i\,\xi13_i + x23_j\,\xi23_i -$$
$$2\epsilon\,a2_k\,x23_j\,\xi23_i + x23_k\,\xi23_i + 2\epsilon\,a2_j\,x23_k\,\xi23_i - \epsilon\,x12_k\,x23_j\,\xi12_i\,\xi23_i +$$
$$\epsilon\,x13_k\,x23_j\,\xi13_i\,\xi23_i - \epsilon\,x13_j\,x23_k\,\xi13_i\,\xi23_i + \epsilon\,x12_j\,x23_k\,(4\,\xi13_i + \xi12_i\,\xi23_i)]$$

In[•]:=
```
ans = 𝔼[x12_j ξ12_i - 2 ϵ a1_k x12_j ξ12_i + x12_k ξ12_i + 2 ϵ a1_j x12_k ξ12_i +
    x13_j ξ13_i - 2 ϵ a1_k x13_j ξ13_i - 2 ϵ a2_k x13_j ξ13_i + x13_k ξ13_i + 2 ϵ a1_j x13_k ξ13_i +
    2 ϵ a2_j x13_k ξ13_i + ϵ x12_k x13_j ξ12_i ξ13_i - ϵ x12_j x13_k ξ12_i ξ13_i + x23_j ξ23_i -
    2 ϵ a2_k x23_j ξ23_i + x23_k ξ23_i + 2 ϵ a2_j x23_k ξ23_i - ϵ x12_k x23_j ξ12_i ξ23_i +
    ϵ x13_k x23_j ξ13_i ξ23_i - ϵ x13_j x23_k ξ13_i ξ23_i + ϵ x12_j x23_k (4 ξ13_i + ξ12_i ξ23_i)]
```
Out[•]=
$$\mathbb{E}[x12_j\,\xi12_i - 2\epsilon\,a1_k\,x12_j\,\xi12_i + x12_k\,\xi12_i + 2\epsilon\,a1_j\,x12_k\,\xi12_i +$$
$$x13_j\,\xi13_i - 2\epsilon\,a1_k\,x13_j\,\xi13_i - 2\epsilon\,a2_k\,x13_j\,\xi13_i + x13_k\,\xi13_i + 2\epsilon\,a1_j\,x13_k\,\xi13_i +$$
$$2\epsilon\,a2_j\,x13_k\,\xi13_i + \epsilon\,x12_k\,x13_j\,\xi12_i\,\xi13_i - \epsilon\,x12_j\,x13_k\,\xi12_i\,\xi13_i + x23_j\,\xi23_i -$$
$$2\epsilon\,a2_k\,x23_j\,\xi23_i + x23_k\,\xi23_i + 2\epsilon\,a2_j\,x23_k\,\xi23_i - \epsilon\,x12_k\,x23_j\,\xi12_i\,\xi23_i +$$
$$\epsilon\,x13_k\,x23_j\,\xi13_i\,\xi23_i - \epsilon\,x13_j\,x23_k\,\xi13_i\,\xi23_i + \epsilon\,x12_j\,x23_k\,(4\,\xi13_i + \xi12_i\,\xi23_i)]$$

In[•]:=
```
ans /. {(ξ13 | ξ23)_i → 0}
```
Out[•]=
$$\mathbb{E}[x12_j\,\xi12_i - 2\epsilon\,a1_k\,x12_j\,\xi12_i + x12_k\,\xi12_i + 2\epsilon\,a1_j\,x12_k\,\xi12_i]$$

In[•]:=
```
ans /. ϵ → 0
```
Out[•]=
$$\mathbb{E}[x12_j\,\xi12_i + x12_k\,\xi12_i + x13_j\,\xi13_i + x13_k\,\xi13_i + x23_j\,\xi23_i + x23_k\,\xi23_i]$$