

In[]:= **PrintProfile**[]

Out[]:=

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ProfileRoot is root. Profiled time: 1581.03
  ( 1) 0.031/ 14.063 above sol[1, 3]
  ( 1) 0.299/ 1566.670 above sol[1, 4]
  ( 1) 0.032/ 0.297 above sol[2, 2]
DSolve: called 3 times, time in 1477.64/1477.88
  ( 1) 11.157/ 11.157 under sol[1, 3]
  ( 1) 1466.280/ 1466.520 under sol[1, 4]
  ( 1) 0.204/ 0.204 under sol[2, 2]
  ( 42) 0.234/ 0.234 above CF
TTR: called 3 times, time in 69.328/83.327
  ( 1) 2.000/ 2.359 under sol[1, 3]
  ( 1) 67.297/ 80.937 under sol[1, 4]
  ( 1) 0.031/ 0.031 under sol[2, 2]
  ( 218) 0.031/ 12.126 above Ad
  ( 137) 0.390/ 0.390 above CF
  ( 1442) 0.637/ 1.483 above UCF
UB: called 392 times, time in 14.88/21.859
  ( 374) 14.848/ 21.812 under Ad
  ( 18) 0.032/ 0.047 under TT
  ( 15410) 3.790/ 6.979 above UCF
SG: called 3 times, time in 8.407/9.156
  ( 1) 0.142/ 0.172 under sol[1, 3]
  ( 1) 8.250/ 8.969 under sol[1, 4]
  ( 1) 0.015/ 0.015 under sol[2, 2]
  ( 77) 0.015/ 0.749 above Ad
  ( 62) 0/ 0 above CF
  ( 6) 0/ 0 above UCF
CF: called 27025 times, time in 5.474/5.474
  ( 42) 0.234/ 0.234 under DSolve
  ( 137) 0.390/ 0.390 under TTR
  ( 62) 0/ 0 under SG
  ( 26784) 4.850/ 4.850 under UCF
UCF: called 17582 times, time in 4.754/9.604
  ( 3) 0.031/ 0.125 under diff
  ( 1442) 0.637/ 1.483 under TTR
  ( 6) 0/ 0 under SG
  ( 689) 0.156/ 0.423 under Ad
  ( 32) 0.140/ 0.594 under TT
  ( 15410) 3.790/ 6.979 under UB
  ( 26784) 4.850/ 4.850 above CF
sol[1, 4]: called 1 times, time in 0.299/1566.67
  ( 1) 0.299/ 1566.670 under ProfileRoot
  ( 1) 0/ 0.109 above diff
  ( 1) 1466.280/ 1466.520 above DSolve
  ( 1) 0.093/ 0.093 above eqns

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( 1) 0.016/ 9.750 above TTL
( 1) 67.297/ 80.937 above TTR
( 1) 8.250/ 8.969 above SG
eqns: called 3 times, time in 0.093/0.093
( 1) 0/ 0 under sol[1, 3]
( 1) 0.093/ 0.093 under sol[1, 4]
( 1) 0/ 0 under sol[2, 2]
Ad: called 315 times, time in 0.061/22.296
( 218) 0.031/ 12.126 under TTR
( 77) 0.015/ 0.749 under SG
( 20) 0.015/ 9.421 under TT
( 374) 14.848/ 21.812 above UB
( 689) 0.156/ 0.423 above UCF
sol[2, 2]: called 1 times, time in 0.032/0.297
( 1) 0.032/ 0.297 under ProfileRoot
( 1) 0/ 0 above diff
( 1) 0.204/ 0.204 above DSolve
( 1) 0/ 0 above eqns
( 1) 0.015/ 0.015 above TTL
( 1) 0.031/ 0.031 above TTR
( 1) 0.015/ 0.015 above SG
sol[1, 3]: called 1 times, time in 0.031/14.063
( 1) 0.031/ 14.063 under ProfileRoot
( 1) 0/ 0.016 above diff
( 1) 11.157/ 11.157 above DSolve
( 1) 0/ 0 above eqns
( 1) 0/ 0.328 above TTL
( 1) 2.000/ 2.359 above TTR
( 1) 0.142/ 0.172 above SG
TTL: called 3 times, time in 0.031/10.093
( 1) 0/ 0.328 under sol[1, 3]
( 1) 0.016/ 9.750 under sol[1, 4]
( 1) 0.015/ 0.015 under sol[2, 2]
( 3) 0/ 10.062 above TT
TT: called 32 times, time in 0./60.309
( 3) 0/ 10.062 under TTL
( 29) 0/ 50.247 under TT
( 20) 0.015/ 9.421 above Ad
( 29) 0/ 50.247 above TT
( 18) 0.032/ 0.047 above UB
( 32) 0.140/ 0.594 above UCF
diff: called 3 times, time in 0./0.125
( 1) 0/ 0.016 under sol[1, 3]
( 1) 0/ 0.109 under sol[1, 4]
( 1) 0/ 0 under sol[2, 2]
( 3) 0.031/ 0.125 above UCF

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In[ ]:= Module[{Bas = $PBWgens, P},
  Bas = Echo@Join[Bas, Table[A[RandomInteger[{1, $n - 1}]] [RandomInteger[{-2, 2}]], {10}]];
  DeleteCases[_ -> 0] [Flatten@Table[As[X, Bas], As[Y, Bas],
    P = U1[X] U2[Y];
    {X, Y} -> UCF[(P // m1,2→1 // Δ1→1,2) - (P // Δ2→3,4 // Δ1→1,2 // m1,3→1 // m2,4→2)]
  ]
]
» {x12, a1, A1[-1], A1[2], A1[1], A1[0], A1[-2], A1[2], A1[-2], A1[0], A1[0], A1[2]}

Out[ ]=
{ }

In[ ]:= $k
Out[ ]=
1

In[ ]:= $k < ∞
Out[ ]=
True

In[ ]:= ∞ < ∞
Out[ ]=
False

In[ ]:= 
$$\sum_{k=0}^k \frac{(\hbar \in \gamma n)^k}{k!}$$

Out[ ]=

$$e^{n \gamma \in \hbar}$$


In[ ]:= Block[{$k = 2}, CF[-4 γ2 ε2 ħ2 U0[x12, a1] - 4 γ ε2 ħ2 U0[x12, a1, a1]]]
Out[ ]=
-4 γ2 ε2 ħ2 U0[x12, a1] - 4 γ ε2 ħ2 U0[x12, a1, a1]

In[ ]:= Block[{$k = ∞}, Module[{Bas = {x12, x13, x23, a1, a2, A2[0],
  A1[-1], A1[-1], A1[1], A1[0], A2[0], A1[1], A1[2], A2[-1], A1[2]}, P},
  DeleteCases[_ -> 0] [Flatten@Table[As[X, Bas], As[Y, Bas], As[Z, Bas],
    P = U1[X] U2[Y] U3[Z];
    {X, Y, Z} -> UCF[(P // m1,2→2 // m2,3→0) - (P // m2,3→2 // m1,2→0)]
  ]
]]
Out[ ]=
{ }

```

```
In[*]:= Block[{$k = 1}, Module[{Bas = {x12, x13, x23, a1, a2, A2[0]},
  A1[-1], A1[-1], A1[1], A1[0], A2[0], A1[1], A1[2], A2[-1], A1[2]}, P},
  DeleteCases[_ -> 0] [Flatten@Table[As[X, Bas], As[Y, Bas], As[Z, Bas],
    P = U1[X] U2[Y] U3[Z];
    {X, Y, Z} -> UCF[(P // m1,2->2 // m2,3->0) - (P // m2,3->2 // m1,2->0)]
  ]
]]
```

Out[*]=

```
{ {a1, A2[-1], A2[0]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A1[-1]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A1[1]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A1[0]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A2[0]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A1[1]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A1[2]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A2[-1]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a1, A2[-1], A1[2]} -> -2 ∈ ℏ U0[a1, a2] + 2 ∈ ℏ U0[a2, a1],
  {a2, a1, A2[-1]} -> 2 ∈ ℏ U0[a1, a2, a2] - 2 ∈ ℏ U0[a2, a2, a1] }
```

In[*]:= \$EPBWRule

Out[*]=

```
{x12 -> 1, x12i$_ -> {i$, 1}, x13 -> 2, x13i$_ -> {i$, 2},
  x23 -> 3, x23i$_ -> {i$, 3}, a1 -> 4, a1i$_ -> {i$, 4}, A1[_] -> 5,
  A1[_]i$_ -> {i$, 5}, a2 -> 6, a2i$_ -> {i$, 6}, A2[_] -> 7, A2[_]i$_ -> {i$, 7}}
```

In[*]:= \$EPBWGens

Out[*]=

```
{x12, x13, x23, a1, A1[_], a2, A2[_]}
```

$$\begin{aligned}
In[*]:= & -2 e^{-\frac{1}{2} \gamma (2 \alpha_1 - \alpha_2)} \gamma \lambda^2 \hbar \xi_{12_j} \xi_{14_i} + \\
& \frac{2}{3} e^{-\frac{1}{2} \gamma (2 \alpha_1 - \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{12_j} \xi_{24_i} - \frac{2}{3} e^{\frac{1}{2} \gamma (-2 \alpha_1 + \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{12_j} \xi_{24_i} + \\
& \frac{2}{3} e^{-\gamma (2 \alpha_1 - \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_j}^2 \xi_{24_i} - \frac{2}{3} e^{\gamma (-2 \alpha_1 + \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_j}^2 \xi_{24_i} - \\
& \frac{2}{3} e^{\frac{1}{2} \gamma (\alpha_2 - 2 \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{13_i} \xi_{34_j} + \frac{2}{3} e^{-\frac{1}{2} \gamma (-\alpha_2 + 2 \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{13_i} \xi_{34_j} + \\
& \frac{2}{3} e^{\gamma (-\alpha_1 + \alpha_2 - \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_i} \xi_{34_j} - \frac{2}{3} e^{-\gamma (\alpha_1 - \alpha_2 + \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_i} \xi_{34_j} - \\
& \frac{2}{3} e^{\frac{1}{2} \gamma (-3 \alpha_1 + \alpha_2 - \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_j} \xi_{34_j} + \frac{2}{3} e^{-\frac{1}{2} \gamma (3 \alpha_1 - \alpha_2 + \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_j} \xi_{34_j}
\end{aligned}$$

Out[*]=

$$\begin{aligned}
& -2 e^{-\frac{1}{2} \gamma (2 \alpha_1 - \alpha_2)} \gamma \lambda^2 \hbar \xi_{12_j} \xi_{14_i} + \\
& \frac{2}{3} e^{-\frac{1}{2} \gamma (2 \alpha_1 - \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{12_j} \xi_{24_i} - \frac{2}{3} e^{\frac{1}{2} \gamma (-2 \alpha_1 + \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{12_j} \xi_{24_i} + \\
& \frac{2}{3} e^{-\gamma (2 \alpha_1 - \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_j}^2 \xi_{24_i} - \frac{2}{3} e^{\gamma (-2 \alpha_1 + \alpha_2)} \gamma \lambda^3 \hbar \xi_{12_j}^2 \xi_{24_i} - \\
& \frac{2}{3} e^{\frac{1}{2} \gamma (\alpha_2 - 2 \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{13_i} \xi_{34_j} + \frac{2}{3} e^{-\frac{1}{2} \gamma (-\alpha_2 + 2 \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_i} \xi_{13_i} \xi_{34_j} + \\
& \frac{2}{3} e^{\gamma (-\alpha_1 + \alpha_2 - \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_i} \xi_{34_j} - \frac{2}{3} e^{-\gamma (\alpha_1 - \alpha_2 + \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_i} \xi_{34_j} - \\
& \frac{2}{3} e^{\frac{1}{2} \gamma (-3 \alpha_1 + \alpha_2 - \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_j} \xi_{34_j} + \frac{2}{3} e^{-\frac{1}{2} \gamma (3 \alpha_1 - \alpha_2 + \alpha_3)} \gamma \lambda^3 \hbar \xi_{12_j} \xi_{13_j} \xi_{34_j}
\end{aligned}$$