In[•]:=
```
H := 2 p0 p1 - (p2 P2) / 4 - (p3 P3) / 4 - 1 / 4 I p1 P2 z2 + 1 / 4 I p1 p2 Z2 - (p1^2 z2 Z2) / 4 +
  a p2 P2 z2 Z2 - a p3 P3 z2 Z2 + 1 / 2 I a p1 P2 z2^2 Z2 - 1 / 2 I a p1 p2 z2 Z2^2 -
  1 / 4 I p1 P3 z3 + G P2 p3 Z2 z3 - a p2 P3 Z2 z3 - I a p1 P3 z2 Z2 z3 - 1 / 2 I G p1 p3 Z2^2 z3 +
  1 / 2 I G p1 P2 Z2 z3^2 + 1 / 4 I p1 p3 Z3 - a P2 p3 z2 Z3 + g p2 P3 z2 Z3 + 1 / 2 I g p1 P3 z2^2 Z3 +
  I a p1 p3 z2 Z2 Z3 - 1 / 4 p1^2 z3 Z3 - a p2 P2 z3 Z3 + a p3 P3 z3 Z3 - I a p1 P2 z2 z3 Z3 +
  I a p1 p2 Z2 z3 Z3 + 1 / 2 I a p1 P3 z3^2 Z3 - 1 / 2 I g p1 p2 z2 Z3^2 - 1 / 2 I a p1 p3 z3 Z3^2
```

In[•]:=
```
H
```

Out[•]=
$$2\,p0\,p1 - \frac{p2\,P2}{4} - \frac{p3\,P3}{4} - \frac{1}{4}\,i\,p1\,P2\,z2 + \frac{1}{4}\,i\,p1\,p2\,Z2 - \frac{1}{4}\,p1^2\,z2\,Z2 +$$
$$a\,p2\,P2\,z2\,Z2 - a\,p3\,P3\,z2\,Z2 + \frac{1}{2}\,i\,a\,p1\,P2\,z2^2\,Z2 - \frac{1}{2}\,i\,a\,p1\,p2\,z2\,Z2^2 -$$
$$\frac{1}{4}\,i\,p1\,P3\,z3 + G\,P2\,p3\,Z2\,z3 - a\,p2\,P3\,Z2\,z3 - i\,a\,p1\,P3\,z2\,Z2\,z3 - \frac{1}{2}\,i\,G\,p1\,p3\,Z2^2\,z3 +$$
$$\frac{1}{2}\,i\,G\,p1\,P2\,Z2\,z3^2 + \frac{1}{4}\,i\,p1\,p3\,Z3 - a\,P2\,p3\,z2\,Z3 + g\,p2\,P3\,z2\,Z3 + \frac{1}{2}\,i\,g\,p1\,P3\,z2^2\,Z3 +$$
$$i\,a\,p1\,p3\,z2\,Z2\,Z3 - \frac{1}{4}\,p1^2\,z3\,Z3 - a\,p2\,P2\,z3\,Z3 + a\,p3\,P3\,z3\,Z3 - i\,a\,p1\,P2\,z2\,z3\,Z3 +$$
$$i\,a\,p1\,p2\,Z2\,z3\,Z3 + \frac{1}{2}\,i\,a\,p1\,P3\,z3^2\,Z3 - \frac{1}{2}\,i\,g\,p1\,p2\,z2\,Z3^2 - \frac{1}{2}\,i\,a\,p1\,p3\,z3\,Z3^2$$

In[•]:=
$$\mathbf{2\,p0\,p1 - \frac{p2\,P2}{4} - \frac{p3\,P3}{4} - \frac{1}{4}\,i\,p1\,P2\,z2 + \frac{1}{4}\,i\,p1\,p2\,Z2 - \frac{(p1^2\,z2\,Z2)}{4} +}$$
$$\mathbf{a\,p2\,P2\,z2\,Z2 - a\,p3\,P3\,z2\,Z2 + \frac{1}{2}\,i\,a\,p1\,P2\,z2^2\,Z2 - \frac{1}{2}\,i\,a\,p1\,p2\,z2\,Z2^2 -}$$
$$\mathbf{\frac{1}{4}\,i\,p1\,P3\,z3 + G\,P2\,p3\,Z2\,z3 - a\,p2\,P3\,Z2\,z3 - i\,a\,p1\,P3\,z2\,Z2\,z3 - \frac{1}{2}\,i\,G\,p1\,p3\,Z2^2\,z3 +}$$
$$\mathbf{\frac{1}{2}\,i\,G\,p1\,P2\,Z2\,z3^2 + \frac{1}{4}\,i\,p1\,p3\,Z3 - a\,P2\,p3\,z2\,Z3 + g\,p2\,P3\,z2\,Z3 + \frac{1}{2}\,i\,g\,p1\,P3\,z2^2\,Z3 +}$$
$$\mathbf{i\,a\,p1\,p3\,z2\,Z2\,Z3 - \frac{1}{4}\,p1^2\,z3\,Z3 - a\,p2\,P2\,z3\,Z3 + a\,p3\,P3\,z3\,Z3 - i\,a\,p1\,P2\,z2\,z3\,Z3 +}$$
$$\mathbf{i\,a\,p1\,p2\,Z2\,z3\,Z3 + \frac{1}{2}\,i\,a\,p1\,P3\,z3^2\,Z3 - \frac{1}{2}\,i\,g\,p1\,p2\,z2\,Z3^2 - \frac{1}{2}\,i\,a\,p1\,p3\,z3\,Z3^2}$$

Out[•]=
$$2\,p0\,p1 - \frac{p2\,P2}{4} - \frac{p3\,P3}{4} - \frac{1}{4}\,i\,p1\,P2\,z2 + \frac{1}{4}\,i\,p1\,p2\,Z2 - \frac{1}{4}\,p1^2\,z2\,Z2 +$$
$$a\,p2\,P2\,z2\,Z2 - a\,p3\,P3\,z2\,Z2 + \frac{1}{2}\,i\,a\,p1\,P2\,z2^2\,Z2 - \frac{1}{2}\,i\,a\,p1\,p2\,z2\,Z2^2 -$$
$$\frac{1}{4}\,i\,p1\,P3\,z3 + G\,P2\,p3\,Z2\,z3 - a\,p2\,P3\,Z2\,z3 - i\,a\,p1\,P3\,z2\,Z2\,z3 - \frac{1}{2}\,i\,G\,p1\,p3\,Z2^2\,z3 +$$
$$\frac{1}{2}\,i\,G\,p1\,P2\,Z2\,z3^2 + \frac{1}{4}\,i\,p1\,p3\,Z3 - a\,P2\,p3\,z2\,Z3 + g\,p2\,P3\,z2\,Z3 + \frac{1}{2}\,i\,g\,p1\,P3\,z2^2\,Z3 +$$
$$i\,a\,p1\,p3\,z2\,Z2\,Z3 - \frac{1}{4}\,p1^2\,z3\,Z3 - a\,p2\,P2\,z3\,Z3 + a\,p3\,P3\,z3\,Z3 - i\,a\,p1\,P2\,z2\,z3\,Z3 +$$
$$i\,a\,p1\,p2\,Z2\,z3\,Z3 + \frac{1}{2}\,i\,a\,p1\,P3\,z3^2\,Z3 - \frac{1}{2}\,i\,g\,p1\,p2\,z2\,Z3^2 - \frac{1}{2}\,i\,a\,p1\,p3\,z3\,Z3^2$$

In[•]:=
```
dz2 := 2 * D[H, P2]
```

In[•]:= **dz2**

Out[•]= $$2\left(-\frac{p2}{4}-\frac{i\ p1\ z2}{4}+a\ p2\ z2\ Z2+\frac{1}{2}\,i\ a\ p1\ z2^2\ Z2+\right.$$
$$\left.G\ p3\ Z2\ z3+\frac{1}{2}\,i\ G\ p1\ Z2\ z3^2-a\ p3\ z2\ Z3-a\ p2\ z3\ Z3-i\ a\ p1\ z2\ z3\ Z3\right)$$

In[•]:= **dp2 := -2 * D[H, Z2]**

In[•]:= **dp2**

Out[•]= $$-2\left(\frac{i\ p1\ p2}{4}-\frac{p1^2\ z2}{4}+a\ p2\ P2\ z2-a\ p3\ P3\ z2+\right.$$
$$\frac{1}{2}\,i\ a\ p1\ P2\ z2^2-i\ a\ p1\ p2\ z2\ Z2+G\ P2\ p3\ z3-a\ p2\ P3\ z3-i\ a\ p1\ P3\ z2\ z3-$$
$$\left.i\ G\ p1\ p3\ Z2\ z3+\frac{1}{2}\,i\ G\ p1\ P2\ z3^2+i\ a\ p1\ p3\ z2\ Z3+i\ a\ p1\ p2\ z3\ Z3\right)$$

In[•]:= **dz3 := 2 * D[H, P3]**

In[•]:= **dz3**

Out[•]= $$2\left(-\frac{p3}{4}-a\ p3\ z2\ Z2-\frac{i\ p1\ z3}{4}-a\ p2\ Z2\ z3-\right.$$
$$\left.i\ a\ p1\ z2\ Z2\ z3+g\ p2\ z2\ Z3+\frac{1}{2}\,i\ g\ p1\ z2^2\ Z3+a\ p3\ z3\ Z3+\frac{1}{2}\,i\ a\ p1\ z3^2\ Z3\right)$$

In[•]:= **dp3 := -2 * D[H, Z3]**

In[•]:= **dp3**

Out[•]= $$-2\left(\frac{i\ p1\ p3}{4}-a\ P2\ p3\ z2+g\ p2\ P3\ z2+\frac{1}{2}\,i\ g\ p1\ P3\ z2^2+\right.$$
$$i\ a\ p1\ p3\ z2\ Z2-\frac{p1^2\ z3}{4}-a\ p2\ P2\ z3+a\ p3\ P3\ z3-i\ a\ p1\ P2\ z2\ z3+$$
$$\left.i\ a\ p1\ p2\ Z2\ z3+\frac{1}{2}\,i\ a\ p1\ P3\ z3^2-i\ g\ p1\ p2\ z2\ Z3-i\ a\ p1\ p3\ z3\ Z3\right)$$

In[•]:= **z2st := s * z21 + s^3 * z23**

In[•]:= **p2st := s * p21 + s^3 * p23**

In[•]:= **z3st := s * z31 + s^3 * z33**

In[•]:= **p3st := s * p31 + s^3 * p33**

In[•]:= **Z2st := s * Z21 + s^3 * Z23**

In[•]:= **P2st := s * P21 + s^3 * P23**

In[•]:= **Z3st := s * Z31 + s^3 * Z33**

In[•]:= **P3st := s * P31 + s^3 * P33**

In[•]:=
```
dz2 /. {z2 → z2st, z3 → z3st, Z2 → Z2st,
  Z3 → Z3st, p2 → p2st, p3 → p3st, P2 → P2st, P3 → P3st}
```

Out[•]=
$$2\left(\frac{1}{4}\left(-p21\,s-p23\,s^3\right)-\frac{1}{4}\,i\,p1\left(s\,z21+s^3\,z23\right)+a\left(p21\,s+p23\,s^3\right)\left(s\,z21+s^3\,z23\right)\left(s\,Z21+s^3\,Z23\right)+\frac{1}{2}\,i\,a\,p1\left(s\,z21+s^3\,z23\right)^2\left(s\,Z21+s^3\,Z23\right)+G\left(p31\,s+p33\,s^3\right)\left(s\,Z21+s^3\,Z23\right)\left(s\,z31+s^3\,z33\right)+\frac{1}{2}\,i\,G\,p1\left(s\,Z21+s^3\,Z23\right)\left(s\,z31+s^3\,z33\right)^2-a\left(p31\,s+p33\,s^3\right)\left(s\,z21+s^3\,z23\right)\left(s\,Z31+s^3\,Z33\right)-a\left(p21\,s+p23\,s^3\right)\left(s\,z31+s^3\,z33\right)\left(s\,Z31+s^3\,Z33\right)-i\,a\,p1\left(s\,z21+s^3\,z23\right)\left(s\,z31+s^3\,z33\right)\left(s\,Z31+s^3\,Z33\right)\right)$$

In[•]:=
```
Expand[%36]
```

Out[•]=
$$-\frac{p21\,s}{2}-\frac{p23\,s^3}{2}-\frac{1}{2}\,i\,p1\,s\,z21+2\,a\,p21\,s^3\,z21\,Z21+2\,a\,p23\,s^5\,z21\,Z21+i\,a\,p1\,s^3\,z21^2\,Z21-\frac{1}{2}\,i\,p1\,s^3\,z23+2\,a\,p21\,s^5\,Z21\,z23+2\,a\,p23\,s^7\,Z21\,z23+2\,i\,a\,p1\,s^5\,z21\,Z21\,z23+i\,a\,p1\,s^7\,Z21\,z23^2+2\,a\,p21\,s^5\,z21\,Z23+2\,a\,p23\,s^7\,z21\,Z23+i\,a\,p1\,s^5\,z21^2\,Z23+2\,a\,p21\,s^7\,z23\,Z23+2\,a\,p23\,s^9\,z23\,Z23+2\,i\,a\,p1\,s^7\,z21\,z23\,Z23+i\,a\,p1\,s^9\,z23^2\,Z23+2\,G\,p31\,s^3\,Z21\,z31+2\,G\,p33\,s^5\,Z21\,z31+2\,G\,p31\,s^5\,Z23\,z31+2\,G\,p33\,s^7\,Z23\,z31+i\,G\,p1\,s^3\,Z21\,z31^2+i\,G\,p1\,s^5\,Z23\,z31^2-2\,a\,p31\,s^3\,z21\,Z31-2\,a\,p33\,s^5\,z21\,Z31-2\,a\,p31\,s^5\,z23\,Z31-2\,a\,p33\,s^7\,z23\,Z31-2\,a\,p21\,s^3\,z31\,Z31-2\,a\,p23\,s^5\,z31\,Z31-2\,i\,a\,p1\,s^3\,z21\,z31\,Z31-2\,i\,a\,p1\,s^5\,z23\,z31\,Z31+2\,G\,p31\,s^5\,Z21\,z33+2\,G\,p33\,s^7\,Z21\,z33+2\,G\,p31\,s^7\,Z23\,z33+2\,G\,p33\,s^9\,Z23\,z33+2\,i\,G\,p1\,s^5\,Z21\,z31\,z33+2\,i\,G\,p1\,s^7\,Z23\,z31\,z33-2\,a\,p21\,s^5\,Z31\,z33-2\,a\,p23\,s^7\,Z31\,z33-2\,i\,a\,p1\,s^5\,z21\,Z31\,z33-2\,i\,a\,p1\,s^7\,z23\,Z31\,z33+i\,G\,p1\,s^7\,Z21\,z33^2+i\,G\,p1\,s^9\,Z23\,z33^2-2\,a\,p31\,s^5\,z21\,Z33-2\,a\,p33\,s^7\,z21\,Z33-2\,a\,p31\,s^7\,z23\,Z33-2\,a\,p33\,s^9\,z23\,Z33-2\,a\,p21\,s^5\,z31\,Z33-2\,a\,p23\,s^7\,z31\,Z33-2\,i\,a\,p1\,s^5\,z21\,z31\,Z33-2\,i\,a\,p1\,s^7\,z23\,z31\,Z33-2\,a\,p21\,s^7\,z33\,Z33-2\,a\,p23\,s^9\,z33\,Z33-2\,i\,a\,p1\,s^7\,z21\,z33\,Z33-2\,i\,a\,p1\,s^9\,z23\,z33\,Z33$$

In[•]:=
```
Collect[%37, s]
```

Out[•]=
$$s\left(-\frac{p21}{2}-\frac{i\ p1\ z21}{2}\right)+$$
$$s^3\left(-\frac{p23}{2}+2\ a\ p21\ z21\ Z21+i\ a\ p1\ z21^2\ Z21-\frac{i\ p1\ z23}{2}+2\ G\ p31\ Z21\ z31+i\ G\ p1\ Z21\ z31^2-\right.$$
$$\left.2\ a\ p31\ z21\ Z31-2\ a\ p21\ z31\ Z31-2\ i\ a\ p1\ z21\ z31\ Z31\right)+$$
$$s^5\left(2\ a\ p23\ z21\ Z21+2\ a\ p21\ Z21\ z23+2\ i\ a\ p1\ z21\ Z21\ z23+2\ a\ p21\ z21\ Z23+\right.$$
$$i\ a\ p1\ z21^2\ Z23+2\ G\ p33\ Z21\ z31+2\ G\ p31\ Z23\ z31+i\ G\ p1\ Z23\ z31^2-$$
$$2\ a\ p33\ z21\ Z31-2\ a\ p31\ z23\ Z31-2\ a\ p23\ z31\ Z31-2\ i\ a\ p1\ z23\ z31\ Z31+$$
$$2\ G\ p31\ Z21\ z33+2\ i\ G\ p1\ Z21\ z31\ z33-2\ a\ p21\ Z31\ z33-2\ i\ a\ p1\ z21\ Z31\ z33-$$
$$\left.2\ a\ p31\ z21\ Z33-2\ a\ p21\ z31\ Z33-2\ i\ a\ p1\ z21\ z31\ Z33\right)+$$
$$s^7\left(2\ a\ p23\ Z21\ z23+i\ a\ p1\ Z21\ z23^2+2\ a\ p23\ z21\ Z23+2\ a\ p21\ z23\ Z23+2\ i\ a\ p1\ z21\ z23\ Z23+\right.$$
$$2\ G\ p33\ Z23\ z31-2\ a\ p33\ z23\ Z31+2\ G\ p33\ Z21\ z33+2\ G\ p31\ Z23\ z33+2\ i\ G\ p1\ Z23\ z31\ z33-$$
$$2\ a\ p23\ Z31\ z33-2\ i\ a\ p1\ z23\ Z31\ z33+i\ G\ p1\ Z21\ z33^2-2\ a\ p33\ z21\ Z33-2\ a\ p31\ z23\ Z33-$$
$$\left.2\ a\ p23\ z31\ Z33-2\ i\ a\ p1\ z23\ z31\ Z33-2\ a\ p21\ z33\ Z33-2\ i\ a\ p1\ z21\ z33\ Z33\right)+$$
$$s^9\left(2\ a\ p23\ z23\ Z23+i\ a\ p1\ z23^2\ Z23+2\ G\ p33\ Z23\ z33+i\ G\ p1\ Z23\ z33^2-\right.$$
$$\left.2\ a\ p33\ z23\ Z33-2\ a\ p23\ z33\ Z33-2\ i\ a\ p1\ z23\ z33\ Z33\right)$$

In[•]:=
```
dp2 /. {z2 → z2st, z3 → z3st, Z2 → Z2st,
  Z3 → Z3st, p2 → p2st, p3 → p3st, P2 → P2st, P3 → P3st}
```

Out[•]=
$$-2\left(\frac{1}{4}i\ p1\ \left(p21\ s+p23\ s^3\right)-\frac{1}{4}p1^2\ \left(s\ z21+s^3\ z23\right)+\right.$$
$$a\ \left(p21\ s+p23\ s^3\right)\ \left(P21\ s+P23\ s^3\right)\ \left(s\ z21+s^3\ z23\right)-$$
$$a\ \left(p31\ s+p33\ s^3\right)\ \left(P31\ s+P33\ s^3\right)\ \left(s\ z21+s^3\ z23\right)+\frac{1}{2}i\ a\ p1\ \left(P21\ s+P23\ s^3\right)$$
$$\left(s\ z21+s^3\ z23\right)^2-i\ a\ p1\ \left(p21\ s+p23\ s^3\right)\ \left(s\ z21+s^3\ z23\right)\ \left(s\ Z21+s^3\ Z23\right)+$$
$$G\ \left(P21\ s+P23\ s^3\right)\ \left(p31\ s+p33\ s^3\right)\ \left(s\ z31+s^3\ z33\right)-$$
$$a\ \left(p21\ s+p23\ s^3\right)\ \left(P31\ s+P33\ s^3\right)\ \left(s\ z31+s^3\ z33\right)-$$
$$i\ a\ p1\ \left(P31\ s+P33\ s^3\right)\ \left(s\ z21+s^3\ z23\right)\ \left(s\ z31+s^3\ z33\right)-$$
$$i\ G\ p1\ \left(p31\ s+p33\ s^3\right)\ \left(s\ Z21+s^3\ Z23\right)\ \left(s\ z31+s^3\ z33\right)+$$
$$\frac{1}{2}i\ G\ p1\ \left(P21\ s+P23\ s^3\right)\ \left(s\ z31+s^3\ z33\right)^2+$$
$$i\ a\ p1\ \left(p31\ s+p33\ s^3\right)\ \left(s\ z21+s^3\ z23\right)\ \left(s\ Z31+s^3\ Z33\right)+$$
$$\left.i\ a\ p1\ \left(p21\ s+p23\ s^3\right)\ \left(s\ z31+s^3\ z33\right)\ \left(s\ Z31+s^3\ Z33\right)\right)$$

In[•]:= **Expand[%39]**

Out[•]=
$$-\frac{1}{2}\,i\,p1\,p21\,s-\frac{1}{2}\,i\,p1\,p23\,s^3+\frac{1}{2}\,p1^2\,s\,z21-2\,a\,p21\,P21\,s^3\,z21+2\,a\,p31\,P31\,s^3\,z21-$$
$$2\,a\,P21\,p23\,s^5\,z21-2\,a\,p21\,P23\,s^5\,z21+2\,a\,P31\,p33\,s^5\,z21+2\,a\,p31\,P33\,s^5\,z21-$$
$$2\,a\,p23\,P23\,s^7\,z21+2\,a\,p33\,P33\,s^7\,z21-i\,a\,p1\,P21\,s^3\,z21^2-i\,a\,p1\,P23\,s^5\,z21^2+$$
$$2\,i\,a\,p1\,p21\,s^3\,z21\,Z21+2\,i\,a\,p1\,p23\,s^5\,z21\,Z21+\frac{1}{2}\,p1^2\,s^3\,z23-2\,a\,p21\,P21\,s^5\,z23+$$
$$2\,a\,p31\,P31\,s^5\,z23-2\,a\,P21\,p23\,s^7\,z23-2\,a\,p21\,P23\,s^7\,z23+2\,a\,P31\,p33\,s^7\,z23+$$
$$2\,a\,p31\,P33\,s^7\,z23-2\,a\,p23\,P23\,s^9\,z23+2\,a\,p33\,P33\,s^9\,z23-2\,i\,a\,p1\,P21\,s^5\,z21\,z23-$$
$$2\,i\,a\,p1\,P23\,s^7\,z21\,z23+2\,i\,a\,p1\,p21\,s^5\,Z21\,z23+2\,i\,a\,p1\,p23\,s^7\,Z21\,z23-$$
$$i\,a\,p1\,P21\,s^7\,z23^2-i\,a\,p1\,P23\,s^9\,z23^2+2\,i\,a\,p1\,p21\,s^5\,z21\,Z23+2\,i\,a\,p1\,p23\,s^7\,z21\,Z23+$$
$$2\,i\,a\,p1\,p21\,s^7\,z23\,Z23+2\,i\,a\,p1\,p23\,s^9\,z23\,Z23-2\,G\,P21\,p31\,s^3\,z31+2\,a\,p21\,P31\,s^3\,z31-$$
$$2\,G\,P23\,p31\,s^5\,z31+2\,a\,p23\,P31\,s^5\,z31-2\,G\,P21\,p33\,s^5\,z31+2\,a\,p21\,P33\,s^5\,z31-$$
$$2\,G\,P23\,p33\,s^7\,z31+2\,a\,p23\,P33\,s^7\,z31+2\,i\,a\,p1\,P31\,s^3\,z21\,z31+2\,i\,a\,p1\,P33\,s^5\,z21\,z31+$$
$$2\,i\,G\,p1\,p31\,s^3\,Z21\,z31+2\,i\,G\,p1\,p33\,s^5\,Z21\,z31+2\,i\,a\,p1\,P31\,s^5\,z23\,z31+$$
$$2\,i\,a\,p1\,P33\,s^7\,z23\,z31+2\,i\,G\,p1\,p31\,s^5\,Z23\,z31+2\,i\,G\,p1\,p33\,s^7\,Z23\,z31-$$
$$i\,G\,p1\,P21\,s^3\,z31^2-i\,G\,p1\,P23\,s^5\,z31^2-2\,i\,a\,p1\,p31\,s^3\,z21\,Z31-2\,i\,a\,p1\,p33\,s^5\,z21\,Z31-$$
$$2\,i\,a\,p1\,p31\,s^5\,z23\,Z31-2\,i\,a\,p1\,p33\,s^7\,z23\,Z31-2\,i\,a\,p1\,p21\,s^3\,z31\,Z31-$$
$$2\,i\,a\,p1\,p23\,s^5\,z31\,Z31-2\,G\,P21\,p31\,s^5\,z33+2\,a\,p21\,P31\,s^5\,z33-2\,G\,P23\,p31\,s^7\,z33+$$
$$2\,a\,p23\,P31\,s^7\,z33-2\,G\,P21\,p33\,s^7\,z33+2\,a\,p21\,P33\,s^7\,z33-2\,G\,P23\,p33\,s^9\,z33+$$
$$2\,a\,p23\,P33\,s^9\,z33+2\,i\,a\,p1\,P31\,s^5\,z21\,z33+2\,i\,a\,p1\,P33\,s^7\,z21\,z33+2\,i\,G\,p1\,p31\,s^5\,Z21\,z33+$$
$$2\,i\,G\,p1\,p33\,s^7\,Z21\,z33+2\,i\,a\,p1\,P31\,s^7\,z23\,z33+2\,i\,a\,p1\,P33\,s^9\,z23\,z33+$$
$$2\,i\,G\,p1\,p31\,s^7\,Z23\,z33+2\,i\,G\,p1\,p33\,s^9\,Z23\,z33-2\,i\,G\,p1\,P21\,s^5\,z31\,z33-$$
$$2\,i\,G\,p1\,P23\,s^7\,z31\,z33-2\,i\,a\,p1\,p21\,s^5\,Z31\,z33-2\,i\,a\,p1\,p23\,s^7\,Z31\,z33-$$
$$i\,G\,p1\,P21\,s^7\,z33^2-i\,G\,p1\,P23\,s^9\,z33^2-2\,i\,a\,p1\,p31\,s^5\,z21\,Z33-2\,i\,a\,p1\,p33\,s^7\,z21\,Z33-$$
$$2\,i\,a\,p1\,p31\,s^7\,z23\,Z33-2\,i\,a\,p1\,p33\,s^9\,z23\,Z33-2\,i\,a\,p1\,p21\,s^5\,z31\,Z33-$$
$$2\,i\,a\,p1\,p23\,s^7\,z31\,Z33-2\,i\,a\,p1\,p21\,s^7\,z33\,Z33-2\,i\,a\,p1\,p23\,s^9\,z33\,Z33$$

In[•]:=
```
Collect[%40, s]
```

Out[•]=
$$s\left(-\frac{1}{2}\,i\,p1\,p21+\frac{p1^2\,z21}{2}\right)+$$
$$s^3\left(-\frac{1}{2}\,i\,p1\,p23-2\,a\,p21\,P21\,z21+2\,a\,p31\,P31\,z21-i\,a\,p1\,P21\,z21^2+2\,i\,a\,p1\,p21\,z21\,Z21+\right.$$
$$\frac{p1^2\,z23}{2}-2\,G\,P21\,p31\,z31+2\,a\,p21\,P31\,z31+2\,i\,a\,p1\,P31\,z21\,z31+$$
$$\left.2\,i\,G\,p1\,p31\,Z21\,z31-i\,G\,p1\,P21\,z31^2-2\,i\,a\,p1\,p31\,z21\,Z31-2\,i\,a\,p1\,p21\,z31\,Z31\right)+$$
$$s^5\left(-2\,a\,P21\,p23\,z21-2\,a\,p21\,P23\,z21+2\,a\,P31\,p33\,z21+2\,a\,p31\,P33\,z21-\right.$$
$$i\,a\,p1\,P23\,z21^2+2\,i\,a\,p1\,p23\,z21\,Z21-2\,a\,p21\,P21\,z23+2\,a\,p31\,P31\,z23-$$
$$2\,i\,a\,p1\,P21\,z21\,z23+2\,i\,a\,p1\,p21\,Z21\,z23+2\,i\,a\,p1\,p21\,z21\,Z23-2\,G\,P23\,p31\,z31+$$
$$2\,a\,p23\,P31\,z31-2\,G\,P21\,p33\,z31+2\,a\,p21\,P33\,z31+2\,i\,a\,p1\,P33\,z21\,z31+$$
$$2\,i\,G\,p1\,p33\,Z21\,z31+2\,i\,a\,p1\,P31\,z23\,z31+2\,i\,G\,p1\,p31\,Z23\,z31-i\,G\,p1\,P23\,z31^2-$$
$$2\,i\,a\,p1\,p33\,z21\,Z31-2\,i\,a\,p1\,p31\,z23\,Z31-2\,i\,a\,p1\,p23\,z31\,Z31-2\,G\,P21\,p31\,z33+$$
$$2\,a\,p21\,P31\,z33+2\,i\,a\,p1\,P31\,z21\,z33+2\,i\,G\,p1\,p31\,Z21\,z33-2\,i\,G\,p1\,P21\,z31\,z33-$$
$$\left.2\,i\,a\,p1\,p21\,Z31\,z33-2\,i\,a\,p1\,p31\,z21\,Z33-2\,i\,a\,p1\,p21\,z31\,Z33\right)+$$
$$s^7\left(-2\,a\,p23\,P23\,z21+2\,a\,p33\,P33\,z21-2\,a\,P21\,p23\,z23-2\,a\,p21\,P23\,z23+\right.$$
$$2\,a\,P31\,p33\,z23+2\,a\,p31\,P33\,z23-2\,i\,a\,p1\,P23\,z21\,z23+2\,i\,a\,p1\,p23\,Z21\,z23-$$
$$i\,a\,p1\,P21\,z23^2+2\,i\,a\,p1\,p23\,z21\,Z23+2\,i\,a\,p1\,p21\,z23\,Z23-2\,G\,P23\,p33\,z31+$$
$$2\,a\,p23\,P33\,z31+2\,i\,a\,p1\,P33\,z23\,z31+2\,i\,G\,p1\,p33\,Z23\,z31-2\,i\,a\,p1\,p33\,z23\,Z31-$$
$$2\,G\,P23\,p31\,z33+2\,a\,p23\,P31\,z33-2\,G\,P21\,p33\,z33+2\,a\,p21\,P33\,z33+$$
$$2\,i\,a\,p1\,P33\,z21\,z33+2\,i\,G\,p1\,p33\,Z21\,z33+2\,i\,a\,p1\,P31\,z23\,z33+2\,i\,G\,p1\,p31\,Z23\,z33-$$
$$2\,i\,G\,p1\,P23\,z31\,z33-2\,i\,a\,p1\,p23\,Z31\,z33-i\,G\,p1\,P21\,z33^2-2\,i\,a\,p1\,p33\,z21\,Z33-$$
$$\left.2\,i\,a\,p1\,p31\,z23\,Z33-2\,i\,a\,p1\,p23\,z31\,Z33-2\,i\,a\,p1\,p21\,z33\,Z33\right)+$$
$$s^9\left(-2\,a\,p23\,P23\,z23+2\,a\,p33\,P33\,z23-i\,a\,p1\,P23\,z23^2+2\,i\,a\,p1\,p23\,z23\,Z23-\right.$$
$$2\,G\,P23\,p33\,z33+2\,a\,p23\,P33\,z33+2\,i\,a\,p1\,P33\,z23\,z33+2\,i\,G\,p1\,p33\,Z23\,z33-$$
$$\left.i\,G\,p1\,P23\,z33^2-2\,i\,a\,p1\,p33\,z23\,Z33-2\,i\,a\,p1\,p23\,z33\,Z33\right)$$

In[•]:=
```
DSolve[{l'[t] == -m[t]/2 - I p1 * l[t]/2,
  m'[t] == -1/2 I p1 * m[t] + p1^2 * l[t]/2}, {l[t], m[t]}, t]
```

Out[•]=
$$\left\{\left\{l[t]\to\frac{1}{2}e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[1]+\frac{1}{2\,p1}i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)C[2],\right.\right.$$
$$\left.\left.m[t]\to-\frac{1}{2}i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)p1\,C[1]+\frac{1}{2}e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[2]\right\}\right\}$$

In[•]:=
$$\frac{1}{2}e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[1]+\frac{i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)C[2]}{2\,p1}$$

Out[•]=
$$\frac{1}{2}e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[1]+\frac{i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)C[2]}{2\,p1}$$

In[•]:=
$$-\frac{1}{2}\,i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)\,p1\,C[1]+\frac{1}{2}\,e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)\,C[2]$$

Out[•]=
$$-\frac{1}{2}\,i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)\,p1\,C[1]+\frac{1}{2}\,e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)\,C[2]$$

In[•]:=
```
dz3 /. {z2 → z2st, z3 → z3st, Z2 → Z2st,
  Z3 → Z3st, p2 → p2st, p3 → p3st, P2 → P2st, P3 → P3st}
```

Out[•]=
$$2\left(\frac{1}{4}\left(-p31\,s-p33\,s^3\right)-a\left(p31\,s+p33\,s^3\right)\left(s\,z21+s^3\,z23\right)\left(s\,Z21+s^3\,Z23\right)-\right.$$
$$\frac{1}{4}\,i\,p1\left(s\,z31+s^3\,z33\right)-a\left(p21\,s+p23\,s^3\right)\left(s\,Z21+s^3\,Z23\right)\left(s\,z31+s^3\,z33\right)-$$
$$i\,a\,p1\left(s\,z21+s^3\,z23\right)\left(s\,Z21+s^3\,Z23\right)\left(s\,z31+s^3\,z33\right)+$$
$$g\left(p21\,s+p23\,s^3\right)\left(s\,z21+s^3\,z23\right)\left(s\,Z31+s^3\,Z33\right)+$$
$$\frac{1}{2}\,i\,g\,p1\left(s\,z21+s^3\,z23\right)^2\left(s\,Z31+s^3\,Z33\right)+a\left(p31\,s+p33\,s^3\right)$$
$$\left.\left(s\,z31+s^3\,z33\right)\left(s\,Z31+s^3\,Z33\right)+\frac{1}{2}\,i\,a\,p1\left(s\,z31+s^3\,z33\right)^2\left(s\,Z31+s^3\,Z33\right)\right)$$

In[•]:=
```
Expand[%45]
```

Out[•]=
$$-\frac{p31\,s}{2}-\frac{p33\,s^3}{2}-2\,a\,p31\,s^3\,z21\,Z21-2\,a\,p33\,s^5\,z21\,Z21-2\,a\,p31\,s^5\,Z21\,z23-2\,a\,p33\,s^7\,Z21\,z23-$$
$$2\,a\,p31\,s^5\,z21\,Z23-2\,a\,p33\,s^7\,z21\,Z23-2\,a\,p31\,s^7\,z23\,Z23-2\,a\,p33\,s^9\,z23\,Z23-\frac{1}{2}\,i\,p1\,s\,z31-$$
$$2\,a\,p21\,s^3\,Z21\,z31-2\,a\,p23\,s^5\,Z21\,z31-2\,i\,a\,p1\,s^3\,z21\,Z21\,z31-2\,i\,a\,p1\,s^5\,Z21\,z23\,z31-$$
$$2\,a\,p21\,s^5\,Z23\,z31-2\,a\,p23\,s^7\,Z23\,z31-2\,i\,a\,p1\,s^5\,z21\,Z23\,z31-2\,i\,a\,p1\,s^7\,z23\,Z23\,z31+$$
$$2\,g\,p21\,s^3\,z21\,Z31+2\,g\,p23\,s^5\,z21\,Z31+i\,g\,p1\,s^3\,z21^2\,Z31+2\,g\,p21\,s^5\,z23\,Z31+$$
$$2\,g\,p23\,s^7\,z23\,Z31+2\,i\,g\,p1\,s^5\,z21\,z23\,Z31+i\,g\,p1\,s^7\,z23^2\,Z31+2\,a\,p31\,s^3\,z31\,Z31+$$
$$2\,a\,p33\,s^5\,z31\,Z31+i\,a\,p1\,s^3\,z31^2\,Z31-\frac{1}{2}\,i\,p1\,s^3\,z33-2\,a\,p21\,s^5\,Z21\,z33-2\,a\,p23\,s^7\,Z21\,z33-$$
$$2\,i\,a\,p1\,s^5\,z21\,Z21\,z33-2\,i\,a\,p1\,s^7\,Z21\,z23\,z33-2\,a\,p21\,s^7\,Z23\,z33-2\,a\,p23\,s^9\,Z23\,z33-$$
$$2\,i\,a\,p1\,s^7\,z21\,Z23\,z33-2\,i\,a\,p1\,s^9\,z23\,Z23\,z33+2\,a\,p31\,s^5\,Z31\,z33+2\,a\,p33\,s^7\,Z31\,z33+$$
$$2\,i\,a\,p1\,s^5\,z31\,Z31\,z33+i\,a\,p1\,s^7\,Z31\,z33^2+2\,g\,p21\,s^5\,z21\,Z33+2\,g\,p23\,s^7\,z21\,Z33+$$
$$i\,g\,p1\,s^5\,z21^2\,Z33+2\,g\,p21\,s^7\,z23\,Z33+2\,g\,p23\,s^9\,z23\,Z33+2\,i\,g\,p1\,s^7\,z21\,z23\,Z33+$$
$$i\,g\,p1\,s^9\,z23^2\,Z33+2\,a\,p31\,s^5\,z31\,Z33+2\,a\,p33\,s^7\,z31\,Z33+i\,a\,p1\,s^5\,z31^2\,Z33+$$
$$2\,a\,p31\,s^7\,z33\,Z33+2\,a\,p33\,s^9\,z33\,Z33+2\,i\,a\,p1\,s^7\,z31\,z33\,Z33+i\,a\,p1\,s^9\,z33^2\,Z33$$

In[•]:=
```
Collect[%, s]
```

Out[•]=
$$s\left(-\frac{p31}{2}-\frac{i\ p1\ z31}{2}\right)+$$
$$s^3\left(-\frac{p33}{2}-2\ a\ p31\ z21\ Z21-2\ a\ p21\ Z21\ z31-2\ i\ a\ p1\ z21\ Z21\ z31+2\ g\ p21\ z21\ Z31+\right.$$
$$\left.i\ g\ p1\ z21^2\ Z31+2\ a\ p31\ z31\ Z31+i\ a\ p1\ z31^2\ Z31-\frac{i\ p1\ z33}{2}\right)+$$
$$s^5\left(-2\ a\ p33\ z21\ Z21-2\ a\ p31\ Z21\ z23-2\ a\ p31\ z21\ Z23-2\ a\ p23\ Z21\ z31-\right.$$
$$2\ i\ a\ p1\ Z21\ z23\ z31-2\ a\ p21\ Z23\ z31-2\ i\ a\ p1\ z21\ Z23\ z31+$$
$$2\ g\ p23\ z21\ Z31+2\ g\ p21\ z23\ Z31+2\ i\ g\ p1\ z21\ z23\ Z31+2\ a\ p33\ z31\ Z31-$$
$$2\ a\ p21\ Z21\ z33-2\ i\ a\ p1\ z21\ Z21\ z33+2\ a\ p31\ Z31\ z33+2\ i\ a\ p1\ z31\ Z31\ z33+$$
$$\left.2\ g\ p21\ z21\ Z33+i\ g\ p1\ z21^2\ Z33+2\ a\ p31\ z31\ Z33+i\ a\ p1\ z31^2\ Z33\right)+$$
$$s^7\left(-2\ a\ p33\ Z21\ z23-2\ a\ p33\ z21\ Z23-2\ a\ p31\ z23\ Z23-2\ a\ p23\ Z23\ z31-2\ i\ a\ p1\ z23\ Z23\ z31+\right.$$
$$2\ g\ p23\ z23\ Z31+i\ g\ p1\ z23^2\ Z31-2\ a\ p23\ Z21\ z33-2\ i\ a\ p1\ Z21\ z23\ z33-2\ a\ p21\ Z23\ z33-$$
$$2\ i\ a\ p1\ z21\ Z23\ z33+2\ a\ p33\ Z31\ z33+i\ a\ p1\ Z31\ z33^2+2\ g\ p23\ z21\ Z33+2\ g\ p21\ z23\ Z33+$$
$$\left.2\ i\ g\ p1\ z21\ z23\ Z33+2\ a\ p33\ z31\ Z33+2\ a\ p31\ z33\ Z33+2\ i\ a\ p1\ z31\ z33\ Z33\right)+$$
$$s^9\left(-2\ a\ p33\ z23\ Z23-2\ a\ p23\ Z23\ z33-2\ i\ a\ p1\ z23\ Z23\ z33+2\ g\ p23\ z23\ Z33+\right.$$
$$\left.i\ g\ p1\ z23^2\ Z33+2\ a\ p33\ z33\ Z33+i\ a\ p1\ z33^2\ Z33\right)$$

In[•]:=
```
dp3 /. {z2 → z2st, z3 → z3st, Z2 → Z2st,
  Z3 → Z3st, p2 → p2st, p3 → p3st, P2 → P2st, P3 → P3st}
```

Out[•]=
$$-2\left(\frac{1}{4}i\ p1\ (p31\ s+p33\ s^3)-a\ (P21\ s+P23\ s^3)\ (p31\ s+p33\ s^3)\ (s\ z21+s^3\ z23)+\right.$$
$$g\ (p21\ s+p23\ s^3)\ (P31\ s+P33\ s^3)\ (s\ z21+s^3\ z23)+\frac{1}{2}i\ g\ p1\ (P31\ s+P33\ s^3)$$
$$(s\ z21+s^3\ z23)^2+i\ a\ p1\ (p31\ s+p33\ s^3)\ (s\ z21+s^3\ z23)\ (s\ Z21+s^3\ Z23)-$$
$$\frac{1}{4}p1^2\ (s\ z31+s^3\ z33)-a\ (p21\ s+p23\ s^3)\ (P21\ s+P23\ s^3)\ (s\ z31+s^3\ z33)+$$
$$a\ (p31\ s+p33\ s^3)\ (P31\ s+P33\ s^3)\ (s\ z31+s^3\ z33)-$$
$$i\ a\ p1\ (P21\ s+P23\ s^3)\ (s\ z21+s^3\ z23)\ (s\ z31+s^3\ z33)+$$
$$i\ a\ p1\ (p21\ s+p23\ s^3)\ (s\ Z21+s^3\ Z23)\ (s\ z31+s^3\ z33)+$$
$$\frac{1}{2}i\ a\ p1\ (P31\ s+P33\ s^3)\ (s\ z31+s^3\ z33)^2-$$
$$i\ g\ p1\ (p21\ s+p23\ s^3)\ (s\ z21+s^3\ z23)\ (s\ Z31+s^3\ Z33)-$$
$$\left.i\ a\ p1\ (p31\ s+p33\ s^3)\ (s\ z31+s^3\ z33)\ (s\ Z31+s^3\ Z33)\right)$$

In[•]:= **Expand[%48]**

Out[•]= $$-\frac{1}{2}\,i\,p1\,p31\,s-\frac{1}{2}\,i\,p1\,p33\,s^3+2\,a\,P21\,p31\,s^3\,z21-2\,g\,p21\,P31\,s^3\,z21+2\,a\,P23\,p31\,s^5\,z21-$$
$$2\,g\,p23\,P31\,s^5\,z21+2\,a\,P21\,p33\,s^5\,z21-2\,g\,p21\,P33\,s^5\,z21+2\,a\,P23\,p33\,s^7\,z21-$$
$$2\,g\,p23\,P33\,s^7\,z21-i\,g\,p1\,P31\,s^3\,z21^2-i\,g\,p1\,P33\,s^5\,z21^2-2\,i\,a\,p1\,p31\,s^3\,z21\,Z21-$$
$$2\,i\,a\,p1\,p33\,s^5\,z21\,Z21+2\,a\,P21\,p31\,s^5\,z23-2\,g\,p21\,P31\,s^5\,z23+2\,a\,P23\,p31\,s^7\,z23-$$
$$2\,g\,p23\,P31\,s^7\,z23+2\,a\,P21\,p33\,s^7\,z23-2\,g\,p21\,P33\,s^7\,z23+2\,a\,P23\,p33\,s^9\,z23-$$
$$2\,g\,p23\,P33\,s^9\,z23-2\,i\,g\,p1\,P31\,s^5\,z21\,z23-2\,i\,g\,p1\,P33\,s^7\,z21\,z23-2\,i\,a\,p1\,p31\,s^5\,Z21\,z23-$$
$$2\,i\,a\,p1\,p33\,s^7\,Z21\,z23-i\,g\,p1\,P31\,s^7\,z23^2-i\,g\,p1\,P33\,s^9\,z23^2-2\,i\,a\,p1\,p31\,s^5\,z21\,Z23-$$
$$2\,i\,a\,p1\,p33\,s^7\,z21\,Z23-2\,i\,a\,p1\,p31\,s^7\,z23\,Z23-2\,i\,a\,p1\,p33\,s^9\,z23\,Z23+\frac{1}{2}\,p1^2\,s\,z31+$$
$$2\,a\,p21\,P21\,s^3\,z31-2\,a\,p31\,P31\,s^3\,z31+2\,a\,P21\,p23\,s^5\,z31+2\,a\,p21\,P23\,s^5\,z31-$$
$$2\,a\,P31\,p33\,s^5\,z31-2\,a\,p31\,P33\,s^5\,z31+2\,a\,p23\,P23\,s^7\,z31-2\,a\,p33\,P33\,s^7\,z31+$$
$$2\,i\,a\,p1\,P21\,s^3\,z21\,z31+2\,i\,a\,p1\,P23\,s^5\,z21\,z31-2\,i\,a\,p1\,p21\,s^3\,Z21\,z31-$$
$$2\,i\,a\,p1\,p23\,s^5\,Z21\,z31+2\,i\,a\,p1\,P21\,s^5\,z23\,z31+2\,i\,a\,p1\,P23\,s^7\,z23\,z31-$$
$$2\,i\,a\,p1\,p21\,s^5\,Z23\,z31-2\,i\,a\,p1\,p23\,s^7\,Z23\,z31-i\,a\,p1\,P31\,s^3\,z31^2-i\,a\,p1\,P33\,s^5\,z31^2+$$
$$2\,i\,g\,p1\,p21\,s^3\,z21\,Z31+2\,i\,g\,p1\,p23\,s^5\,z21\,Z31+2\,i\,g\,p1\,p21\,s^5\,z23\,Z31+$$
$$2\,i\,g\,p1\,p23\,s^7\,z23\,Z31+2\,i\,a\,p1\,p31\,s^3\,z31\,Z31+2\,i\,a\,p1\,p33\,s^5\,z31\,Z31+\frac{1}{2}\,p1^2\,s^3\,z33+$$
$$2\,a\,p21\,P21\,s^5\,z33-2\,a\,p31\,P31\,s^5\,z33+2\,a\,P21\,p23\,s^7\,z33+2\,a\,p21\,P23\,s^7\,z33-$$
$$2\,a\,P31\,p33\,s^7\,z33-2\,a\,p31\,P33\,s^7\,z33+2\,a\,p23\,P23\,s^9\,z33-2\,a\,p33\,P33\,s^9\,z33+$$
$$2\,i\,a\,p1\,P21\,s^5\,z21\,z33+2\,i\,a\,p1\,P23\,s^7\,z21\,z33-2\,i\,a\,p1\,p21\,s^5\,Z21\,z33-$$
$$2\,i\,a\,p1\,p23\,s^7\,Z21\,z33+2\,i\,a\,p1\,P21\,s^7\,z23\,z33+2\,i\,a\,p1\,P23\,s^9\,z23\,z33-$$
$$2\,i\,a\,p1\,p21\,s^7\,Z23\,z33-2\,i\,a\,p1\,p23\,s^9\,Z23\,z33-2\,i\,a\,p1\,P31\,s^5\,z31\,z33-$$
$$2\,i\,a\,p1\,P33\,s^7\,z31\,z33+2\,i\,a\,p1\,p31\,s^5\,Z31\,z33+2\,i\,a\,p1\,p33\,s^7\,Z31\,z33-$$
$$i\,a\,p1\,P31\,s^7\,z33^2-i\,a\,p1\,P33\,s^9\,z33^2+2\,i\,g\,p1\,p21\,s^5\,z21\,Z33+2\,i\,g\,p1\,p23\,s^7\,z21\,Z33+$$
$$2\,i\,g\,p1\,p21\,s^7\,z23\,Z33+2\,i\,g\,p1\,p23\,s^9\,z23\,Z33+2\,i\,a\,p1\,p31\,s^5\,z31\,Z33+$$
$$2\,i\,a\,p1\,p33\,s^7\,z31\,Z33+2\,i\,a\,p1\,p31\,s^7\,z33\,Z33+2\,i\,a\,p1\,p33\,s^9\,z33\,Z33$$

In[•]:=
```
Collect[%, s]
```

Out[•]=
$$s\left(-\frac{1}{2}\,i\,p1\,p31+\frac{p1^2\,z31}{2}\right)+$$
$$s^3\left(-\frac{1}{2}\,i\,p1\,p33+2\,a\,P21\,p31\,z21-2\,g\,p21\,P31\,z21-i\,g\,p1\,P31\,z21^2-2\,i\,a\,p1\,p31\,z21\,Z21+\right.$$
$$2\,a\,p21\,P21\,z31-2\,a\,p31\,P31\,z31+2\,i\,a\,p1\,P21\,z21\,z31-2\,i\,a\,p1\,p21\,Z21\,z31-$$
$$\left.i\,a\,p1\,P31\,z31^2+2\,i\,g\,p1\,p21\,z21\,Z31+2\,i\,a\,p1\,p31\,z31\,Z31+\frac{p1^2\,z33}{2}\right)+$$
$$s^5\left(2\,a\,P23\,p31\,z21-2\,g\,p23\,P31\,z21+2\,a\,P21\,p33\,z21-2\,g\,p21\,P33\,z21-i\,g\,p1\,P33\,z21^2-\right.$$
$$2\,i\,a\,p1\,p33\,z21\,Z21+2\,a\,P21\,p31\,z23-2\,g\,p21\,P31\,z23-2\,i\,g\,p1\,P31\,z21\,z23-$$
$$2\,i\,a\,p1\,p31\,Z21\,z23-2\,i\,a\,p1\,p31\,z21\,Z23+2\,a\,P21\,p23\,z31+2\,a\,p21\,P23\,z31-$$
$$2\,a\,P31\,p33\,z31-2\,a\,p31\,P33\,z31+2\,i\,a\,p1\,P23\,z21\,z31-2\,i\,a\,p1\,p23\,Z21\,z31+$$
$$2\,i\,a\,p1\,P21\,z23\,z31-2\,i\,a\,p1\,p21\,Z23\,z31-i\,a\,p1\,P33\,z31^2+2\,i\,g\,p1\,p23\,z21\,Z31+$$
$$2\,i\,g\,p1\,p21\,z23\,Z31+2\,i\,a\,p1\,p33\,z31\,Z31+2\,a\,p21\,P21\,z33-2\,a\,p31\,P31\,z33+$$
$$2\,i\,a\,p1\,P21\,z21\,z33-2\,i\,a\,p1\,p21\,Z21\,z33-2\,i\,a\,p1\,P31\,z31\,z33+$$
$$\left.2\,i\,a\,p1\,p31\,Z31\,z33+2\,i\,g\,p1\,p21\,z21\,Z33+2\,i\,a\,p1\,p31\,z31\,Z33\right)+$$
$$s^7\left(2\,a\,P23\,p33\,z21-2\,g\,p23\,P33\,z21+2\,a\,P23\,p31\,z23-2\,g\,p23\,P31\,z23+2\,a\,P21\,p33\,z23-\right.$$
$$2\,g\,p21\,P33\,z23-2\,i\,g\,p1\,P33\,z21\,z23-2\,i\,a\,p1\,p33\,Z21\,z23-i\,g\,p1\,P31\,z23^2-$$
$$2\,i\,a\,p1\,p33\,z21\,Z23-2\,i\,a\,p1\,p31\,z23\,Z23+2\,a\,p23\,P23\,z31-2\,a\,p33\,P33\,z31+$$
$$2\,i\,a\,p1\,P23\,z23\,z31-2\,i\,a\,p1\,p23\,Z23\,z31+2\,i\,g\,p1\,p23\,z23\,Z31+2\,a\,P21\,p23\,z33+$$
$$2\,a\,p21\,P23\,z33-2\,a\,P31\,p33\,z33-2\,a\,p31\,P33\,z33+2\,i\,a\,p1\,P23\,z21\,z33-$$
$$2\,i\,a\,p1\,p23\,Z21\,z33+2\,i\,a\,p1\,P21\,z23\,z33-2\,i\,a\,p1\,p21\,Z23\,z33-$$
$$2\,i\,a\,p1\,P33\,z31\,z33+2\,i\,a\,p1\,p33\,Z31\,z33-i\,a\,p1\,P31\,z33^2+2\,i\,g\,p1\,p23\,z21\,Z33+$$
$$\left.2\,i\,g\,p1\,p21\,z23\,Z33+2\,i\,a\,p1\,p33\,z31\,Z33+2\,i\,a\,p1\,p31\,z33\,Z33\right)+$$
$$s^9\left(2\,a\,P23\,p33\,z23-2\,g\,p23\,P33\,z23-i\,g\,p1\,P33\,z23^2-2\,i\,a\,p1\,p33\,z23\,Z23+\right.$$
$$2\,a\,p23\,P23\,z33-2\,a\,p33\,P33\,z33+2\,i\,a\,p1\,P23\,z23\,z33-2\,i\,a\,p1\,p23\,Z23\,z33-$$
$$\left.i\,a\,p1\,P33\,z33^2+2\,i\,g\,p1\,p23\,z23\,Z33+2\,i\,a\,p1\,p33\,z33\,Z33\right)$$

In[•]:=
```
DSolve[{l'[t] == -m[t]/2 - I p1 * l[t]/2,
  m'[t] == -(1/2) I p1 * m[t] + p1^2 * l[t]/2}, {l[t], m[t]}, t]
```

Out[•]=
$$\left\{\left\{l[t]\to\frac{1}{2}e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[1]+\frac{1}{2\,p1}i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)C[2],\right.\right.$$
$$\left.\left.m[t]\to-\frac{1}{2}\,i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)p1\,C[1]+\frac{1}{2}\,e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[2]\right\}\right\}$$

In[•]:=
```
1/2 e^(-I p1 t) (1 + e^(I p1 t)) C[1] + (I e^(-I p1 t) (-1 + e^(I p1 t)) C[2])/(2 p1)
```

Out[•]=
$$\frac{1}{2}\,e^{-i\,p1\,t}\left(1+e^{i\,p1\,t}\right)C[1]+\frac{i\,e^{-i\,p1\,t}\left(-1+e^{i\,p1\,t}\right)C[2]}{2\,p1}$$

In[•]:= $-\frac{1}{2} i e^{-i p1 t} \left(-1 + e^{i p1 t}\right) p1\, C[1] + \frac{1}{2} e^{-i p1 t} \left(1 + e^{i p1 t}\right) C[2]$

Out[•]= $-\frac{1}{2} i e^{-i p1 t} \left(-1 + e^{i p1 t}\right) p1\, C[1] + \frac{1}{2} e^{-i p1 t} \left(1 + e^{i p1 t}\right) C[2]$

In[•]:= $z21 := \frac{1}{2} e^{-i p1 t} \left(1 + e^{i p1 t}\right) * c1 + \frac{i e^{-i p1 t} \left(-1 + e^{i p1 t}\right) * c2}{2\, p1}$

In[•]:= $p1 := -1$

In[•]:= $Z21 := \frac{1}{2} i * C2 * e^{-i t} \left(-1 + e^{i t}\right) + \frac{1}{2} C1 * e^{-i t} \left(1 + e^{i t}\right)$

In[•]:= $p21 := -\frac{1}{2} i e^{-i p1 t} \left(-1 + e^{i p1 t}\right) * p1 * c1 + \frac{1}{2} e^{-i p1 t} \left(1 + e^{i p1 t}\right) * c2$

In[•]:= $P21 := -\frac{1}{2} i * C1 * e^{-i t} \left(-1 + e^{i t}\right) + \frac{1}{2} * C2 * e^{-i t} \left(1 + e^{i t}\right)$

In[•]:= $z31 := \frac{1}{2} e^{-i p1 t} \left(1 + e^{i p1 t}\right) * d1 + \frac{i e^{-i p1 t} \left(-1 + e^{i p1 t}\right) * d2}{2\, p1}$

In[•]:= $Z31 := \frac{1}{2} i * D2 * e^{-i t} \left(-1 + e^{i t}\right) + \frac{1}{2} * D2 * e^{-i t} \left(1 + e^{i t}\right)$

In[•]:= $p31 := -\frac{1}{2} i e^{-i p1 t} \left(-1 + e^{i p1 t}\right) p1 * d1 + \frac{1}{2} e^{-i p1 t} \left(1 + e^{i p1 t}\right) * d2$

In[•]:= $P31 := -\frac{1}{2} i * D1 * e^{-i t} \left(-1 + e^{i t}\right) + \frac{1}{2} * D2 * e^{-i t} \left(1 + e^{i t}\right)$

In[•]:=
```
dz2 /. {z2 → z2st, z3 → z3st, Z2 → Z2st,
  Z3 → Z3st, p2 → p2st, p3 → p3st, P2 → P2st, P3 → P3st}
```

Out[•]=
$$2\left(\frac{1}{4}\left(-\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s-p23\,s^3\right)+\right.$$
$$\frac{1}{4}\,i\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)+$$
$$a\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p23\,s^3\right)$$
$$\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)$$
$$\left(\left(\frac{1}{2}\,i\,C2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C1\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z23\right)-$$
$$\frac{1}{2}\,i\,a\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)^2$$
$$\left(\left(\frac{1}{2}\,i\,C2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C1\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z23\right)+$$
$$G\left(\left(\frac{1}{2}\,i\,d1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3\right)$$
$$\left(\left(\frac{1}{2}\,i\,C2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C1\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z23\right)$$
$$\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)-$$
$$\frac{1}{2}\,i\,G\left(\left(\frac{1}{2}\,i\,C2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C1\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z23\right)$$
$$\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)^2-$$
$$a\left(\left(\frac{1}{2}\,i\,d1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3\right)$$
$$\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)$$
$$\left(\left(\frac{1}{2}\,i\,D2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z33\right)-$$
$$a\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p23\,s^3\right)$$
$$\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)$$
$$\left(\left(\frac{1}{2}\,i\,D2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z33\right)+$$
$$i\,a\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)$$
$$\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)$$
$$\left.\left(\left(\frac{1}{2}\,i\,D2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z33\right)\right)$$

In[•]:=
```
Expand[%63]
```

Out[•]=
$$\frac{1}{2}\,i\,c1\,e^{i\,t}\,s-\frac{1}{2}\,c2\,e^{i\,t}\,s-\frac{1}{8}\,i\,a\,c1^2\,C1\,s^3+\frac{1}{4}\,a\,c1\,C1\,c2\,s^3-\frac{3}{8}\,i\,a\,C1\,c2^2\,s^3-\frac{3}{8}\,a\,c1^2\,C2\,s^3+$$

$$\frac{1}{4}\,i\,a\,c1\,c2\,C2\,s^3-\frac{1}{8}\,a\,c2^2\,C2\,s^3+\left(\frac{3}{4}+\frac{i}{4}\right)a\,c1\,d1\,D2\,s^3-\left(\frac{1}{4}+\frac{i}{4}\right)a\,c2\,d1\,D2\,s^3-$$
$$\left(\frac{1}{4}+\frac{i}{4}\right)a\,c1\,d2\,D2\,s^3+\left(\frac{1}{4}+\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,s^3+\frac{1}{8}\,i\,a\,c1^2\,C1\,e^{-i\,t}\,s^3+$$
$$\frac{1}{4}\,a\,c1\,C1\,c2\,e^{-i\,t}\,s^3-\frac{1}{8}\,i\,a\,C1\,c2^2\,e^{-i\,t}\,s^3+\frac{1}{8}\,a\,c1^2\,C2\,e^{-i\,t}\,s^3-\frac{1}{4}\,i\,a\,c1\,c2\,C2\,e^{-i\,t}\,s^3-$$
$$\frac{1}{8}\,a\,c2^2\,C2\,e^{-i\,t}\,s^3-\left(\frac{1}{4}+\frac{i}{4}\right)a\,c1\,d1\,D2\,e^{-i\,t}\,s^3-\left(\frac{1}{4}-\frac{i}{4}\right)a\,c2\,d1\,D2\,e^{-i\,t}\,s^3-$$
$$\left(\frac{1}{4}-\frac{i}{4}\right)a\,c1\,d2\,D2\,e^{-i\,t}\,s^3+\left(\frac{1}{4}+\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{-i\,t}\,s^3-\frac{5}{8}\,i\,a\,c1^2\,C1\,e^{i\,t}\,s^3+$$
$$\frac{3}{4}\,a\,c1\,C1\,c2\,e^{i\,t}\,s^3+\frac{1}{8}\,i\,a\,C1\,c2^2\,e^{i\,t}\,s^3-\frac{1}{8}\,a\,c1^2\,C2\,e^{i\,t}\,s^3-\frac{3}{4}\,i\,a\,c1\,c2\,C2\,e^{i\,t}\,s^3+$$
$$\frac{5}{8}\,a\,c2^2\,C2\,e^{i\,t}\,s^3+\left(\frac{1}{4}+\frac{5\,i}{4}\right)a\,c1\,d1\,D2\,e^{i\,t}\,s^3-\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c2\,d1\,D2\,e^{i\,t}\,s^3-$$
$$\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c1\,d2\,D2\,e^{i\,t}\,s^3-\left(\frac{5}{4}+\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{i\,t}\,s^3-\frac{3}{8}\,i\,a\,c1^2\,C1\,e^{2\,i\,t}\,s^3+$$
$$\frac{3}{4}\,a\,c1\,C1\,c2\,e^{2\,i\,t}\,s^3+\frac{3}{8}\,i\,a\,C1\,c2^2\,e^{2\,i\,t}\,s^3+\frac{3}{8}\,a\,c1^2\,C2\,e^{2\,i\,t}\,s^3+\frac{3}{4}\,i\,a\,c1\,c2\,C2\,e^{2\,i\,t}\,s^3-$$
$$\frac{3}{8}\,a\,c2^2\,C2\,e^{2\,i\,t}\,s^3-\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,e^{2\,i\,t}\,s^3-\left(\frac{3}{4}+\frac{3\,i}{4}\right)a\,c2\,d1\,D2\,e^{2\,i\,t}\,s^3-$$
$$\left(\frac{3}{4}+\frac{3\,i}{4}\right)a\,c1\,d2\,D2\,e^{2\,i\,t}\,s^3+\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,e^{2\,i\,t}\,s^3-\frac{1}{8}\,i\,C1\,d1^2\,G\,s^3-\frac{3}{8}\,C2\,d1^2\,G\,s^3+$$
$$\frac{1}{4}\,C1\,d1\,d2\,G\,s^3+\frac{1}{4}\,i\,C2\,d1\,d2\,G\,s^3-\frac{3}{8}\,i\,C1\,d2^2\,G\,s^3-\frac{1}{8}\,C2\,d2^2\,G\,s^3+\frac{1}{8}\,i\,C1\,d1^2\,e^{-i\,t}\,G\,s^3+$$
$$\frac{1}{8}\,C2\,d1^2\,e^{-i\,t}\,G\,s^3+\frac{1}{4}\,C1\,d1\,d2\,e^{-i\,t}\,G\,s^3-\frac{1}{4}\,i\,C2\,d1\,d2\,e^{-i\,t}\,G\,s^3-\frac{1}{8}\,i\,C1\,d2^2\,e^{-i\,t}\,G\,s^3-$$
$$\frac{1}{8}\,C2\,d2^2\,e^{-i\,t}\,G\,s^3-\frac{5}{8}\,i\,C1\,d1^2\,e^{i\,t}\,G\,s^3-\frac{1}{8}\,C2\,d1^2\,e^{i\,t}\,G\,s^3+\frac{3}{4}\,C1\,d1\,d2\,e^{i\,t}\,G\,s^3-$$
$$\frac{3}{4}\,i\,C2\,d1\,d2\,e^{i\,t}\,G\,s^3+\frac{1}{8}\,i\,C1\,d2^2\,e^{i\,t}\,G\,s^3+\frac{5}{8}\,C2\,d2^2\,e^{i\,t}\,G\,s^3-\frac{3}{8}\,i\,C1\,d1^2\,e^{2\,i\,t}\,G\,s^3+$$
$$\frac{3}{8}\,C2\,d1^2\,e^{2\,i\,t}\,G\,s^3+\frac{3}{4}\,C1\,d1\,d2\,e^{2\,i\,t}\,G\,s^3+\frac{3}{4}\,i\,C2\,d1\,d2\,e^{2\,i\,t}\,G\,s^3+\frac{3}{8}\,i\,C1\,d2^2\,e^{2\,i\,t}\,G\,s^3-$$
$$\frac{3}{8}\,C2\,d2^2\,e^{2\,i\,t}\,G\,s^3-\frac{p23\,s^3}{2}+a\,c1\,C1\,p23\,s^5+a\,c2\,C2\,p23\,s^5-a\,d1\,D2\,p23\,s^5-$$
$$a\,d2\,D2\,p23\,s^5+\frac{1}{2}\,a\,c1\,C1\,e^{-i\,t}\,p23\,s^5-\frac{1}{2}\,i\,a\,C1\,c2\,e^{-i\,t}\,p23\,s^5-\frac{1}{2}\,i\,a\,c1\,C2\,e^{-i\,t}\,p23\,s^5-$$
$$\frac{1}{2}\,a\,c2\,C2\,e^{-i\,t}\,p23\,s^5-\left(\frac{1}{2}-\frac{i}{2}\right)a\,d1\,D2\,e^{-i\,t}\,p23\,s^5+\left(\frac{1}{2}+\frac{i}{2}\right)a\,d2\,D2\,e^{-i\,t}\,p23\,s^5+$$
$$\frac{1}{2}\,a\,c1\,C1\,e^{i\,t}\,p23\,s^5+\frac{1}{2}\,i\,a\,C1\,c2\,e^{i\,t}\,p23\,s^5+\frac{1}{2}\,i\,a\,c1\,C2\,e^{i\,t}\,p23\,s^5-\frac{1}{2}\,a\,c2\,C2\,e^{i\,t}\,p23\,s^5-$$
$$\left(\frac{1}{2}+\frac{i}{2}\right)a\,d1\,D2\,e^{i\,t}\,p23\,s^5+\left(\frac{1}{2}-\frac{i}{2}\right)a\,d2\,D2\,e^{i\,t}\,p23\,s^5-a\,c1\,D2\,p33\,s^5-a\,c2\,D2\,p33\,s^5-$$
$$\left(\frac{1}{2}-\frac{i}{2}\right)a\,c1\,D2\,e^{-i\,t}\,p33\,s^5+\left(\frac{1}{2}+\frac{i}{2}\right)a\,c2\,D2\,e^{-i\,t}\,p33\,s^5-\left(\frac{1}{2}+\frac{i}{2}\right)a\,c1\,D2\,e^{i\,t}\,p33\,s^5+$$
$$\left(\frac{1}{2}-\frac{i}{2}\right)a\,c2\,D2\,e^{i\,t}\,p33\,s^5+C1\,d1\,G\,p33\,s^5+C2\,d2\,G\,p33\,s^5+\frac{1}{2}\,C1\,d1\,e^{-i\,t}\,G\,p33\,s^5-$$

$$\frac{1}{2}\,i\,C2\,d1\,e^{-i\,t}\,G\,p33\,s^5-\frac{1}{2}\,i\,C1\,d2\,e^{-i\,t}\,G\,p33\,s^5-\frac{1}{2}\,C2\,d2\,e^{-i\,t}\,G\,p33\,s^5+\frac{1}{2}\,C1\,d1\,e^{i\,t}\,G\,p33\,s^5+$$
$$\frac{1}{2}\,i\,C2\,d1\,e^{i\,t}\,G\,p33\,s^5+\frac{1}{2}\,i\,C1\,d2\,e^{i\,t}\,G\,p33\,s^5-\frac{1}{2}\,C2\,d2\,e^{i\,t}\,G\,p33\,s^5+\frac{1}{2}\,i\,s^3\,z23-$$
$$i\,a\,c1\,C1\,s^5\,z23+a\,C1\,c2\,s^5\,z23-a\,c1\,C2\,s^5\,z23-i\,a\,c2\,C2\,s^5\,z23+(1+i)\,a\,d1\,D2\,s^5\,z23-$$
$$(1-i)\,a\,d2\,D2\,s^5\,z23-i\,a\,c1\,C1\,e^{i\,t}\,s^5\,z23+a\,C1\,c2\,e^{i\,t}\,s^5\,z23+a\,c1\,C2\,e^{i\,t}\,s^5\,z23+$$
$$i\,a\,c2\,C2\,e^{i\,t}\,s^5\,z23-(1-i)\,a\,d1\,D2\,e^{i\,t}\,s^5\,z23-(1+i)\,a\,d2\,D2\,e^{i\,t}\,s^5\,z23+a\,C1\,p23\,s^7\,z23+$$
$$i\,a\,C2\,p23\,s^7\,z23+a\,C1\,e^{-i\,t}\,p23\,s^7\,z23-i\,a\,C2\,e^{-i\,t}\,p23\,s^7\,z23-(1+i)\,a\,D2\,p33\,s^7\,z23-$$
$$(1-i)\,a\,D2\,e^{-i\,t}\,p33\,s^7\,z23-\frac{1}{2}\,i\,a\,C1\,s^7\,z23^2+\frac{1}{2}\,a\,C2\,s^7\,z23^2-\frac{1}{2}\,i\,a\,C1\,e^{-i\,t}\,s^7\,z23^2-$$
$$\frac{1}{2}\,a\,C2\,e^{-i\,t}\,s^7\,z23^2+\frac{1}{4}\,i\,a\,c1^2\,s^5\,Z23+\frac{1}{2}\,a\,c1\,c2\,s^5\,Z23-\frac{1}{4}\,i\,a\,c2^2\,s^5\,Z23-\frac{1}{2}\,i\,a\,c1^2\,e^{i\,t}\,s^5\,Z23-$$
$$\frac{1}{2}\,i\,a\,c2^2\,e^{i\,t}\,s^5\,Z23-\frac{3}{4}\,i\,a\,c1^2\,e^{2\,i\,t}\,s^5\,Z23+\frac{3}{2}\,a\,c1\,c2\,e^{2\,i\,t}\,s^5\,Z23+\frac{3}{4}\,i\,a\,c2^2\,e^{2\,i\,t}\,s^5\,Z23+$$
$$\frac{1}{4}\,i\,d1^2\,G\,s^5\,Z23+\frac{1}{2}\,d1\,d2\,G\,s^5\,Z23-\frac{1}{4}\,i\,d2^2\,G\,s^5\,Z23-\frac{1}{2}\,i\,d1^2\,e^{i\,t}\,G\,s^5\,Z23-$$
$$\frac{1}{2}\,i\,d2^2\,e^{i\,t}\,G\,s^5\,Z23-\frac{3}{4}\,i\,d1^2\,e^{2\,i\,t}\,G\,s^5\,Z23+\frac{3}{2}\,d1\,d2\,e^{2\,i\,t}\,G\,s^5\,Z23+\frac{3}{4}\,i\,d2^2\,e^{2\,i\,t}\,G\,s^5\,Z23+$$
$$a\,c1\,p23\,s^7\,Z23-i\,a\,c2\,p23\,s^7\,Z23+a\,c1\,e^{i\,t}\,p23\,s^7\,Z23+i\,a\,c2\,e^{i\,t}\,p23\,s^7\,Z23+d1\,G\,p33\,s^7\,Z23-$$
$$i\,d2\,G\,p33\,s^7\,Z23+d1\,e^{i\,t}\,G\,p33\,s^7\,Z23+i\,d2\,e^{i\,t}\,G\,p33\,s^7\,Z23-2\,i\,a\,c1\,e^{i\,t}\,s^7\,z23\,Z23+$$
$$2\,a\,c2\,e^{i\,t}\,s^7\,z23\,Z23+2\,a\,p23\,s^9\,z23\,Z23-i\,a\,s^9\,z23^2\,Z23+(1+i)\,a\,c1\,D2\,s^5\,z33-$$
$$(1-i)\,a\,c2\,D2\,s^5\,z33-(1-i)\,a\,c1\,D2\,e^{i\,t}\,s^5\,z33-(1+i)\,a\,c2\,D2\,e^{i\,t}\,s^5\,z33-$$
$$i\,C1\,d1\,G\,s^5\,z33-C2\,d1\,G\,s^5\,z33+C1\,d2\,G\,s^5\,z33-i\,C2\,d2\,G\,s^5\,z33-i\,C1\,d1\,e^{i\,t}\,G\,s^5\,z33+$$
$$C2\,d1\,e^{i\,t}\,G\,s^5\,z33+C1\,d2\,e^{i\,t}\,G\,s^5\,z33+i\,C2\,d2\,e^{i\,t}\,G\,s^5\,z33-(1+i)\,a\,D2\,p23\,s^7\,z33-$$
$$(1-i)\,a\,D2\,e^{-i\,t}\,p23\,s^7\,z33+C1\,G\,p33\,s^7\,z33+i\,C2\,G\,p33\,s^7\,z33+C1\,e^{-i\,t}\,G\,p33\,s^7\,z33-$$
$$i\,C2\,e^{-i\,t}\,G\,p33\,s^7\,z33-(1-i)\,a\,D2\,s^7\,z23\,z33+(1+i)\,a\,D2\,e^{-i\,t}\,s^7\,z23\,z33-$$
$$2\,i\,d1\,e^{i\,t}\,G\,s^7\,Z23\,z33+2\,d2\,e^{i\,t}\,G\,s^7\,Z23\,z33+2\,G\,p33\,s^9\,Z23\,z33-\frac{1}{2}\,i\,C1\,G\,s^7\,z33^2+$$
$$\frac{1}{2}\,C2\,G\,s^7\,z33^2-\frac{1}{2}\,i\,C1\,e^{-i\,t}\,G\,s^7\,z33^2-\frac{1}{2}\,C2\,e^{-i\,t}\,G\,s^7\,z33^2-i\,G\,s^9\,Z23\,z33^2-\frac{1}{2}\,i\,a\,c1\,d1\,s^5\,Z33-$$
$$\frac{1}{2}\,a\,c2\,d1\,s^5\,Z33-\frac{1}{2}\,a\,c1\,d2\,s^5\,Z33+\frac{1}{2}\,i\,a\,c2\,d2\,s^5\,Z33+i\,a\,c1\,d1\,e^{i\,t}\,s^5\,Z33+$$
$$i\,a\,c2\,d2\,e^{i\,t}\,s^5\,Z33+\frac{3}{2}\,i\,a\,c1\,d1\,e^{2\,i\,t}\,s^5\,Z33-\frac{3}{2}\,a\,c2\,d1\,e^{2\,i\,t}\,s^5\,Z33-\frac{3}{2}\,a\,c1\,d2\,e^{2\,i\,t}\,s^5\,Z33-$$
$$\frac{3}{2}\,i\,a\,c2\,d2\,e^{2\,i\,t}\,s^5\,Z33-a\,d1\,p23\,s^7\,Z33+i\,a\,d2\,p23\,s^7\,Z33-a\,d1\,e^{i\,t}\,p23\,s^7\,Z33-$$
$$i\,a\,d2\,e^{i\,t}\,p23\,s^7\,Z33-a\,c1\,p33\,s^7\,Z33+i\,a\,c2\,p33\,s^7\,Z33-a\,c1\,e^{i\,t}\,p33\,s^7\,Z33-$$
$$i\,a\,c2\,e^{i\,t}\,p33\,s^7\,Z33+2\,i\,a\,d1\,e^{i\,t}\,s^7\,z23\,Z33-2\,a\,d2\,e^{i\,t}\,s^7\,z23\,Z33-2\,a\,p33\,s^9\,z23\,Z33+$$
$$2\,i\,a\,c1\,e^{i\,t}\,s^7\,z33\,Z33-2\,a\,c2\,e^{i\,t}\,s^7\,z33\,Z33-2\,a\,p23\,s^9\,z33\,Z33+2\,i\,a\,s^9\,z23\,z33\,Z33$$

In[•]:=
```
Collect[%, s]
```

Out[•]=
$$\left(\frac{1}{2}\,i\,c1\,e^{i\,t}-\frac{1}{2}\,c2\,e^{i\,t}\right)s+$$
$$s^3\left(-\frac{1}{8}\,i\,a\,c1^2\,C1+\frac{1}{4}\,a\,c1\,C1\,c2-\frac{3}{8}\,i\,a\,C1\,c2^2-\frac{3}{8}\,a\,c1^2\,C2+\frac{1}{4}\,i\,a\,c1\,c2\,C2-\frac{1}{8}\,a\,c2^2\,C2+\right.$$
$$\left.\left(\frac{3}{4}+\frac{i}{4}\right)a\,c1\,d1\,D2-\left(\frac{1}{4}+\frac{i}{4}\right)a\,c2\,d1\,D2-\left(\frac{1}{4}+\frac{i}{4}\right)a\,c1\,d2\,D2+\left(\frac{1}{4}+\frac{3\,i}{4}\right)a\,c2\,d2\,D2+\right.$$

$$\frac{1}{8}\,i\,a\,c1^2\,C1\,e^{-i\,t}+\frac{1}{4}\,a\,c1\,C1\,c2\,e^{-i\,t}-\frac{1}{8}\,i\,a\,C1\,c2^2\,e^{-i\,t}+\frac{1}{8}\,a\,c1^2\,C2\,e^{-i\,t}-$$
$$\frac{1}{4}\,i\,a\,c1\,c2\,C2\,e^{-i\,t}-\frac{1}{8}\,a\,c2^2\,C2\,e^{-i\,t}-\left(\frac{1}{4}+\frac{i}{4}\right)a\,c1\,d1\,D2\,e^{-i\,t}-\left(\frac{1}{4}-\frac{i}{4}\right)a\,c2\,d1\,D2\,e^{-i\,t}-$$
$$\left(\frac{1}{4}-\frac{i}{4}\right)a\,c1\,d2\,D2\,e^{-i\,t}+\left(\frac{1}{4}+\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{-i\,t}-\frac{5}{8}\,i\,a\,c1^2\,C1\,e^{i\,t}+\frac{3}{4}\,a\,c1\,C1\,c2\,e^{i\,t}+$$
$$\frac{1}{8}\,i\,a\,C1\,c2^2\,e^{i\,t}-\frac{1}{8}\,a\,c1^2\,C2\,e^{i\,t}-\frac{3}{4}\,i\,a\,c1\,c2\,C2\,e^{i\,t}+\frac{5}{8}\,a\,c2^2\,C2\,e^{i\,t}+$$
$$\left(\frac{1}{4}+\frac{5\,i}{4}\right)a\,c1\,d1\,D2\,e^{i\,t}-\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c2\,d1\,D2\,e^{i\,t}-\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c1\,d2\,D2\,e^{i\,t}-$$
$$\left(\frac{5}{4}+\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{i\,t}-\frac{3}{8}\,i\,a\,c1^2\,C1\,e^{2\,i\,t}+\frac{3}{4}\,a\,c1\,C1\,c2\,e^{2\,i\,t}+\frac{3}{8}\,i\,a\,C1\,c2^2\,e^{2\,i\,t}+$$
$$\frac{3}{8}\,a\,c1^2\,C2\,e^{2\,i\,t}+\frac{3}{4}\,i\,a\,c1\,c2\,C2\,e^{2\,i\,t}-\frac{3}{8}\,a\,c2^2\,C2\,e^{2\,i\,t}-\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,e^{2\,i\,t}-$$
$$\left(\frac{3}{4}+\frac{3\,i}{4}\right)a\,c2\,d1\,D2\,e^{2\,i\,t}-\left(\frac{3}{4}+\frac{3\,i}{4}\right)a\,c1\,d2\,D2\,e^{2\,i\,t}+\left(\frac{3}{4}-\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,e^{2\,i\,t}-$$
$$\frac{1}{8}\,i\,C1\,d1^2\,G-\frac{3}{8}\,C2\,d1^2\,G+\frac{1}{4}\,C1\,d1\,d2\,G+\frac{1}{4}\,i\,C2\,d1\,d2\,G-\frac{3}{8}\,i\,C1\,d2^2\,G-\frac{1}{8}\,C2\,d2^2\,G+$$
$$\frac{1}{8}\,i\,C1\,d1^2\,e^{-i\,t}\,G+\frac{1}{8}\,C2\,d1^2\,e^{-i\,t}\,G+\frac{1}{4}\,C1\,d1\,d2\,e^{-i\,t}\,G-\frac{1}{4}\,i\,C2\,d1\,d2\,e^{-i\,t}\,G-$$
$$\frac{1}{8}\,i\,C1\,d2^2\,e^{-i\,t}\,G-\frac{1}{8}\,C2\,d2^2\,e^{-i\,t}\,G-\frac{5}{8}\,i\,C1\,d1^2\,e^{i\,t}\,G-\frac{1}{8}\,C2\,d1^2\,e^{i\,t}\,G+\frac{3}{4}\,C1\,d1\,d2\,e^{i\,t}\,G-$$
$$\frac{3}{4}\,i\,C2\,d1\,d2\,e^{i\,t}\,G+\frac{1}{8}\,i\,C1\,d2^2\,e^{i\,t}\,G+\frac{5}{8}\,C2\,d2^2\,e^{i\,t}\,G-\frac{3}{8}\,i\,C1\,d1^2\,e^{2\,i\,t}\,G+\frac{3}{8}\,C2\,d1^2\,e^{2\,i\,t}\,G+$$
$$\frac{3}{4}\,C1\,d1\,d2\,e^{2\,i\,t}\,G+\frac{3}{4}\,i\,C2\,d1\,d2\,e^{2\,i\,t}\,G+\frac{3}{8}\,i\,C1\,d2^2\,e^{2\,i\,t}\,G-\frac{3}{8}\,C2\,d2^2\,e^{2\,i\,t}\,G-\frac{p23}{2}+\frac{i\,z23}{2}\Bigg)+$$
$$s^5\left(a\,c1\,C1\,p23+a\,c2\,C2\,p23-a\,d1\,D2\,p23-a\,d2\,D2\,p23+\frac{1}{2}\,a\,c1\,C1\,e^{-i\,t}\,p23-\right.$$
$$\frac{1}{2}\,i\,a\,C1\,c2\,e^{-i\,t}\,p23-\frac{1}{2}\,i\,a\,c1\,C2\,e^{-i\,t}\,p23-\frac{1}{2}\,a\,c2\,C2\,e^{-i\,t}\,p23-\left(\frac{1}{2}-\frac{i}{2}\right)a\,d1\,D2\,e^{-i\,t}\,p23+$$
$$\left(\frac{1}{2}+\frac{i}{2}\right)a\,d2\,D2\,e^{-i\,t}\,p23+\frac{1}{2}\,a\,c1\,C1\,e^{i\,t}\,p23+\frac{1}{2}\,i\,a\,C1\,c2\,e^{i\,t}\,p23+\frac{1}{2}\,i\,a\,c1\,C2\,e^{i\,t}\,p23-$$
$$\frac{1}{2}\,a\,c2\,C2\,e^{i\,t}\,p23-\left(\frac{1}{2}+\frac{i}{2}\right)a\,d1\,D2\,e^{i\,t}\,p23+\left(\frac{1}{2}-\frac{i}{2}\right)a\,d2\,D2\,e^{i\,t}\,p23-$$
$$a\,c1\,D2\,p33-a\,c2\,D2\,p33-\left(\frac{1}{2}-\frac{i}{2}\right)a\,c1\,D2\,e^{-i\,t}\,p33+\left(\frac{1}{2}+\frac{i}{2}\right)a\,c2\,D2\,e^{-i\,t}\,p33-$$
$$\left(\frac{1}{2}+\frac{i}{2}\right)a\,c1\,D2\,e^{i\,t}\,p33+\left(\frac{1}{2}-\frac{i}{2}\right)a\,c2\,D2\,e^{i\,t}\,p33+C1\,d1\,G\,p33+C2\,d2\,G\,p33+$$
$$\frac{1}{2}\,C1\,d1\,e^{-i\,t}\,G\,p33-\frac{1}{2}\,i\,C2\,d1\,e^{-i\,t}\,G\,p33-\frac{1}{2}\,i\,C1\,d2\,e^{-i\,t}\,G\,p33-\frac{1}{2}\,C2\,d2\,e^{-i\,t}\,G\,p33+$$
$$\frac{1}{2}\,C1\,d1\,e^{i\,t}\,G\,p33+\frac{1}{2}\,i\,C2\,d1\,e^{i\,t}\,G\,p33+\frac{1}{2}\,i\,C1\,d2\,e^{i\,t}\,G\,p33-\frac{1}{2}\,C2\,d2\,e^{i\,t}\,G\,p33-$$
$$i\,a\,c1\,C1\,z23+a\,C1\,c2\,z23-a\,c1\,C2\,z23-i\,a\,c2\,C2\,z23+(1+i)\,a\,d1\,D2\,z23-$$
$$(1-i)\,a\,d2\,D2\,z23-i\,a\,c1\,C1\,e^{i\,t}\,z23+a\,C1\,c2\,e^{i\,t}\,z23+a\,c1\,C2\,e^{i\,t}\,z23+$$
$$i\,a\,c2\,C2\,e^{i\,t}\,z23-(1-i)\,a\,d1\,D2\,e^{i\,t}\,z23-(1+i)\,a\,d2\,D2\,e^{i\,t}\,z23+\frac{1}{4}\,i\,a\,c1^2\,Z23+$$

$$\frac{1}{2}\,a\,c1\,c2\,Z23-\frac{1}{4}\,i\,a\,c2^2\,Z23-\frac{1}{2}\,i\,a\,c1^2\,e^{i\,t}\,Z23-\frac{1}{2}\,i\,a\,c2^2\,e^{i\,t}\,Z23-\frac{3}{4}\,i\,a\,c1^2\,e^{2\,i\,t}\,Z23+$$
$$\frac{3}{2}\,a\,c1\,c2\,e^{2\,i\,t}\,Z23+\frac{3}{4}\,i\,a\,c2^2\,e^{2\,i\,t}\,Z23+\frac{1}{4}\,i\,d1^2\,G\,Z23+\frac{1}{2}\,d1\,d2\,G\,Z23-\frac{1}{4}\,i\,d2^2\,G\,Z23-$$
$$\frac{1}{2}\,i\,d1^2\,e^{i\,t}\,G\,Z23-\frac{1}{2}\,i\,d2^2\,e^{i\,t}\,G\,Z23-\frac{3}{4}\,i\,d1^2\,e^{2\,i\,t}\,G\,Z23+\frac{3}{2}\,d1\,d2\,e^{2\,i\,t}\,G\,Z23+$$
$$\frac{3}{4}\,i\,d2^2\,e^{2\,i\,t}\,G\,Z23+\left(1+i\right)\,a\,c1\,D2\,z33-\left(1-i\right)\,a\,c2\,D2\,z33-\left(1-i\right)\,a\,c1\,D2\,e^{i\,t}\,z33-$$
$$\left(1+i\right)\,a\,c2\,D2\,e^{i\,t}\,z33-i\,C1\,d1\,G\,z33-C2\,d1\,G\,z33+C1\,d2\,G\,z33-i\,C2\,d2\,G\,z33-$$
$$i\,C1\,d1\,e^{i\,t}\,G\,z33+C2\,d1\,e^{i\,t}\,G\,z33+C1\,d2\,e^{i\,t}\,G\,z33+i\,C2\,d2\,e^{i\,t}\,G\,z33-\frac{1}{2}\,i\,a\,c1\,d1\,Z33-$$
$$\frac{1}{2}\,a\,c2\,d1\,Z33-\frac{1}{2}\,a\,c1\,d2\,Z33+\frac{1}{2}\,i\,a\,c2\,d2\,Z33+i\,a\,c1\,d1\,e^{i\,t}\,Z33+i\,a\,c2\,d2\,e^{i\,t}\,Z33+$$
$$\frac{3}{2}\,i\,a\,c1\,d1\,e^{2\,i\,t}\,Z33-\frac{3}{2}\,a\,c2\,d1\,e^{2\,i\,t}\,Z33-\frac{3}{2}\,a\,c1\,d2\,e^{2\,i\,t}\,Z33-\frac{3}{2}\,i\,a\,c2\,d2\,e^{2\,i\,t}\,Z33\Big)+$$
$$s^7\,\Big(a\,C1\,p23\,z23+i\,a\,C2\,p23\,z23+a\,C1\,e^{-i\,t}\,p23\,z23-i\,a\,C2\,e^{-i\,t}\,p23\,z23-$$
$$\left(1+i\right)\,a\,D2\,p33\,z23-\left(1-i\right)\,a\,D2\,e^{-i\,t}\,p33\,z23-\frac{1}{2}\,i\,a\,C1\,z23^2+\frac{1}{2}\,a\,C2\,z23^2-$$
$$\frac{1}{2}\,i\,a\,C1\,e^{-i\,t}\,z23^2-\frac{1}{2}\,a\,C2\,e^{-i\,t}\,z23^2+a\,c1\,p23\,Z23-i\,a\,c2\,p23\,Z23+$$
$$a\,c1\,e^{i\,t}\,p23\,Z23+i\,a\,c2\,e^{i\,t}\,p23\,Z23+d1\,G\,p33\,Z23-i\,d2\,G\,p33\,Z23+$$
$$d1\,e^{i\,t}\,G\,p33\,Z23+i\,d2\,e^{i\,t}\,G\,p33\,Z23-2\,i\,a\,c1\,e^{i\,t}\,z23\,Z23+2\,a\,c2\,e^{i\,t}\,z23\,Z23-$$
$$\left(1+i\right)\,a\,D2\,p23\,z33-\left(1-i\right)\,a\,D2\,e^{-i\,t}\,p23\,z33+C1\,G\,p33\,z33+i\,C2\,G\,p33\,z33+$$
$$C1\,e^{-i\,t}\,G\,p33\,z33-i\,C2\,e^{-i\,t}\,G\,p33\,z33-\left(1-i\right)\,a\,D2\,z23\,z33+\left(1+i\right)\,a\,D2\,e^{-i\,t}\,z23\,z33-$$
$$2\,i\,d1\,e^{i\,t}\,G\,Z23\,z33+2\,d2\,e^{i\,t}\,G\,Z23\,z33-\frac{1}{2}\,i\,C1\,G\,z33^2+\frac{1}{2}\,C2\,G\,z33^2-$$
$$\frac{1}{2}\,i\,C1\,e^{-i\,t}\,G\,z33^2-\frac{1}{2}\,C2\,e^{-i\,t}\,G\,z33^2-a\,d1\,p23\,Z33+i\,a\,d2\,p23\,Z33-a\,d1\,e^{i\,t}\,p23\,Z33-$$
$$i\,a\,d2\,e^{i\,t}\,p23\,Z33-a\,c1\,p33\,Z33+i\,a\,c2\,p33\,Z33-a\,c1\,e^{i\,t}\,p33\,Z33-i\,a\,c2\,e^{i\,t}\,p33\,Z33+$$
$$2\,i\,a\,d1\,e^{i\,t}\,z23\,Z33-2\,a\,d2\,e^{i\,t}\,z23\,Z33+2\,i\,a\,c1\,e^{i\,t}\,z33\,Z33-2\,a\,c2\,e^{i\,t}\,z33\,Z33\Big)+$$
$$s^9\,\left(2\,a\,p23\,z23\,Z23-i\,a\,z23^2\,Z23+2\,G\,p33\,Z23\,z33-i\,G\,Z23\,z33^2-\right.$$
$$\left.2\,a\,p33\,z23\,Z33-2\,a\,p23\,z33\,Z33+2\,i\,a\,z23\,z33\,Z33\right)$$

In[•]:=
```
dp2 /. {z2 → z2st, z3 → z3st, Z2 → Z2st,
  Z3 → Z3st, p2 → p2st, p3 → p3st, P2 → P2st, P3 → P3st}
```

Out[•]=
$$-2\,\left(-\frac{1}{4}\,i\,\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\,\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\,\left(1+e^{-i\,t}\right)\right)\,s+p23\,s^3\right)+\right.$$
$$\frac{1}{4}\,\left(-\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\,\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\,\left(1+e^{-i\,t}\right)\right)\,s-s^3\,z23\right)+$$
$$a\,\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\,\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\,\left(1+e^{-i\,t}\right)\right)\,s+p23\,s^3\right)$$
$$\left(\left(-\frac{1}{2}\,i\,C1\,e^{-i\,t}\,\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C2\,e^{-i\,t}\,\left(1+e^{i\,t}\right)\right)\,s+P23\,s^3\right)$$
$$\left.\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\,\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\,\left(1+e^{-i\,t}\right)\right)\,s+s^3\,z23\right)-\right.$$

$$
\begin{aligned}
&a\left(\left(\frac{1}{2}\,i\,d1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,D1\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+P33\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)-\\
&\frac{1}{2}\,i\,a\left(\left(-\frac{1}{2}\,i\,C1\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+P23\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)^2+\\
&i\,a\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p23\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)\\
&\left(\left(\frac{1}{2}\,i\,C2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C1\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z23\right)+\\
&G\left(\left(-\frac{1}{2}\,i\,C1\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+P23\,s^3\right)\\
&\left(\left(\frac{1}{2}\,i\,d1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)-\\
&a\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p23\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,D1\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+P33\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)+\\
&i\,a\left(\left(-\frac{1}{2}\,i\,D1\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+P33\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)\\
&\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)+\\
&i\,G\left(\left(\frac{1}{2}\,i\,d1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3\right)\\
&\left(\left(\frac{1}{2}\,i\,C2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C1\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z23\right)\\
&\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)-\\
&\frac{1}{2}\,i\,G\left(\left(-\frac{1}{2}\,i\,C1\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,C2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+P23\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)^2-\\
&i\,a\left(\left(\frac{1}{2}\,i\,d1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3\right)\\
&\left(\left(-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z23\right)
\end{aligned}
$$

$$\left(\left(\frac{1}{2}\,i\,D2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z33\right)-$$
$$i\,a\left(\left(\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c2\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p23\,s^3\right)$$
$$\left(\left(-\frac{1}{2}\,i\,d2\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,d1\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33\right)$$
$$\left(\left(\frac{1}{2}\,i\,D2\,e^{-i\,t}\left(-1+e^{i\,t}\right)+\frac{1}{2}\,D2\,e^{-i\,t}\left(1+e^{i\,t}\right)\right)s+s^3\,Z33\right)\Bigg)$$

In[•]:= **Expand[%66]**

Out[•]=
$$\frac{1}{2}\,c1\,e^{i\,t}\,s+\frac{1}{2}\,i\,c2\,e^{i\,t}\,s-\frac{1}{8}\,a\,c1^2\,C1\,s^3-\frac{1}{4}\,i\,a\,c1\,C1\,c2\,s^3-\frac{3}{8}\,a\,C1\,c2^2\,s^3+$$
$$\frac{3}{8}\,i\,a\,c1^2\,C2\,s^3+\frac{1}{4}\,a\,c1\,c2\,C2\,s^3+\frac{1}{8}\,i\,a\,c2^2\,C2\,s^3+\frac{3}{4}\,a\,c1\,d1\,D1\,s^3-\frac{1}{4}\,i\,a\,c2\,d1\,D1\,s^3-$$
$$\frac{1}{4}\,i\,a\,c1\,D1\,d2\,s^3+\frac{1}{4}\,a\,c2\,D1\,d2\,s^3-\left(\frac{1}{2}+\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,s^3-\left(\frac{1}{4}-\frac{i}{2}\right)a\,c2\,d1\,D2\,s^3-$$
$$\left(\frac{1}{4}-\frac{i}{2}\right)a\,c1\,d2\,D2\,s^3+\left(\frac{1}{2}-\frac{i}{4}\right)a\,c2\,d2\,D2\,s^3+\frac{3}{8}\,a\,c1^2\,C1\,e^{-i\,t}\,s^3-\frac{3}{4}\,i\,a\,c1\,C1\,c2\,e^{-i\,t}\,s^3-$$
$$\frac{3}{8}\,a\,C1\,c2^2\,e^{-i\,t}\,s^3-\frac{3}{8}\,i\,a\,c1^2\,C2\,e^{-i\,t}\,s^3-\frac{3}{4}\,a\,c1\,c2\,C2\,e^{-i\,t}\,s^3+\frac{3}{8}\,i\,a\,c2^2\,C2\,e^{-i\,t}\,s^3-$$
$$\frac{1}{4}\,a\,c1\,d1\,D1\,e^{-i\,t}\,s^3+\frac{1}{4}\,i\,a\,c2\,d1\,D1\,e^{-i\,t}\,s^3+\frac{1}{4}\,i\,a\,c1\,D1\,d2\,e^{-i\,t}\,s^3+\frac{1}{4}\,a\,c2\,D1\,d2\,e^{-i\,t}\,s^3-$$
$$\left(\frac{1}{2}-\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,e^{-i\,t}\,s^3+\left(\frac{3}{4}+\frac{i}{2}\right)a\,c2\,d1\,D2\,e^{-i\,t}\,s^3+\left(\frac{3}{4}+\frac{i}{2}\right)a\,c1\,d2\,D2\,e^{-i\,t}\,s^3+$$
$$\left(\frac{1}{2}-\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,e^{-i\,t}\,s^3-\frac{3}{8}\,a\,c1^2\,C1\,e^{i\,t}\,s^3-\frac{5}{4}\,i\,a\,c1\,C1\,c2\,e^{i\,t}\,s^3+\frac{7}{8}\,a\,C1\,c2^2\,e^{i\,t}\,s^3+$$
$$\frac{7}{8}\,i\,a\,c1^2\,C2\,e^{i\,t}\,s^3-\frac{5}{4}\,a\,c1\,c2\,C2\,e^{i\,t}\,s^3-\frac{3}{8}\,i\,a\,c2^2\,C2\,e^{i\,t}\,s^3+\frac{1}{4}\,a\,c1\,d1\,D1\,e^{i\,t}\,s^3+$$
$$\frac{3}{4}\,i\,a\,c2\,d1\,D1\,e^{i\,t}\,s^3+\frac{3}{4}\,i\,a\,c1\,D1\,d2\,e^{i\,t}\,s^3-\frac{5}{4}\,a\,c2\,D1\,d2\,e^{i\,t}\,s^3+\left(\frac{1}{2}-\frac{7\,i}{4}\right)a\,c1\,d1\,D2\,e^{i\,t}\,s^3+$$
$$\left(\frac{5}{4}+\frac{i}{2}\right)a\,c2\,d1\,D2\,e^{i\,t}\,s^3+\left(\frac{5}{4}+\frac{i}{2}\right)a\,c1\,d2\,D2\,e^{i\,t}\,s^3-\left(\frac{1}{2}-\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,e^{i\,t}\,s^3+$$
$$\frac{1}{8}\,a\,c1^2\,C1\,e^{2\,i\,t}\,s^3+\frac{1}{4}\,i\,a\,c1\,C1\,c2\,e^{2\,i\,t}\,s^3-\frac{1}{8}\,a\,C1\,c2^2\,e^{2\,i\,t}\,s^3+\frac{1}{8}\,i\,a\,c1^2\,C2\,e^{2\,i\,t}\,s^3-$$
$$\frac{1}{4}\,a\,c1\,c2\,C2\,e^{2\,i\,t}\,s^3-\frac{1}{8}\,i\,a\,c2^2\,C2\,e^{2\,i\,t}\,s^3-\frac{3}{4}\,a\,c1\,d1\,D1\,e^{2\,i\,t}\,s^3-\frac{3}{4}\,i\,a\,c2\,d1\,D1\,e^{2\,i\,t}\,s^3-$$
$$\frac{3}{4}\,i\,a\,c1\,D1\,d2\,e^{2\,i\,t}\,s^3+\frac{3}{4}\,a\,c2\,D1\,d2\,e^{2\,i\,t}\,s^3+\left(\frac{1}{2}-\frac{i}{4}\right)a\,c1\,d1\,D2\,e^{2\,i\,t}\,s^3+$$
$$\left(\frac{1}{4}+\frac{i}{2}\right)a\,c2\,d1\,D2\,e^{2\,i\,t}\,s^3+\left(\frac{1}{4}+\frac{i}{2}\right)a\,c1\,d2\,D2\,e^{2\,i\,t}\,s^3-\left(\frac{1}{2}-\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{2\,i\,t}\,s^3-$$
$$\frac{1}{8}\,C1\,d1^2\,G\,s^3+\frac{3}{8}\,i\,C2\,d1^2\,G\,s^3-\frac{1}{4}\,i\,C1\,d1\,d2\,G\,s^3+\frac{1}{4}\,C2\,d1\,d2\,G\,s^3-\frac{3}{8}\,C1\,d2^2\,G\,s^3+$$
$$\frac{1}{8}\,i\,C2\,d2^2\,G\,s^3+\frac{3}{8}\,C1\,d1^2\,e^{-i\,t}\,G\,s^3-\frac{3}{8}\,i\,C2\,d1^2\,e^{-i\,t}\,G\,s^3-\frac{3}{4}\,i\,C1\,d1\,d2\,e^{-i\,t}\,G\,s^3-$$
$$\frac{3}{4}\,C2\,d1\,d2\,e^{-i\,t}\,G\,s^3-\frac{3}{8}\,C1\,d2^2\,e^{-i\,t}\,G\,s^3+\frac{3}{8}\,i\,C2\,d2^2\,e^{-i\,t}\,G\,s^3-\frac{3}{8}\,C1\,d1^2\,e^{i\,t}\,G\,s^3+$$
$$\frac{7}{8}\,i\,C2\,d1^2\,e^{i\,t}\,G\,s^3-\frac{5}{4}\,i\,C1\,d1\,d2\,e^{i\,t}\,G\,s^3-\frac{5}{4}\,C2\,d1\,d2\,e^{i\,t}\,G\,s^3+\frac{7}{8}\,C1\,d2^2\,e^{i\,t}\,G\,s^3-$$

$$\frac{3}{8}\,i\,C2\,d2^2\,e^{i\,t}\,G\,s^3+\frac{1}{8}\,C1\,d1^2\,e^{2\,i\,t}\,G\,s^3+\frac{1}{8}\,i\,C2\,d1^2\,e^{2\,i\,t}\,G\,s^3+\frac{1}{4}\,i\,C1\,d1\,d2\,e^{2\,i\,t}\,G\,s^3-$$
$$\frac{1}{4}\,C2\,d1\,d2\,e^{2\,i\,t}\,G\,s^3-\frac{1}{8}\,C1\,d2^2\,e^{2\,i\,t}\,G\,s^3-\frac{1}{8}\,i\,C2\,d2^2\,e^{2\,i\,t}\,G\,s^3+\frac{1}{2}\,i\,p23\,s^3-$$
$$i\,a\,c1\,C1\,p23\,s^5+a\,C1\,c2\,p23\,s^5-a\,c1\,C2\,p23\,s^5-i\,a\,c2\,C2\,p23\,s^5-a\,D1\,d2\,p23\,s^5+$$
$$(1+i)\,a\,d1\,D2\,p23\,s^5+i\,a\,d2\,D2\,p23\,s^5-i\,a\,c1\,C1\,e^{-i\,t}\,p23\,s^5-a\,C1\,c2\,e^{-i\,t}\,p23\,s^5-$$
$$a\,c1\,C2\,e^{-i\,t}\,p23\,s^5+i\,a\,c2\,C2\,e^{-i\,t}\,p23\,s^5+\frac{1}{2}\,i\,a\,d1\,D1\,e^{-i\,t}\,p23\,s^5+\frac{1}{2}\,a\,D1\,d2\,e^{-i\,t}\,p23\,s^5+$$
$$\left(1+\frac{i}{2}\right)a\,d1\,D2\,e^{-i\,t}\,p23\,s^5+\left(\frac{1}{2}-i\right)a\,d2\,D2\,e^{-i\,t}\,p23\,s^5-\frac{1}{2}\,i\,a\,d1\,D1\,e^{i\,t}\,p23\,s^5+$$
$$\frac{1}{2}\,a\,D1\,d2\,e^{i\,t}\,p23\,s^5+\frac{1}{2}\,i\,a\,d1\,D2\,e^{i\,t}\,p23\,s^5-\frac{1}{2}\,a\,d2\,D2\,e^{i\,t}\,p23\,s^5-\frac{1}{4}\,i\,a\,c1^2\,P23\,s^5-$$
$$\frac{1}{2}\,a\,c1\,c2\,P23\,s^5+\frac{1}{4}\,i\,a\,c2^2\,P23\,s^5+\frac{1}{2}\,i\,a\,c1^2\,e^{i\,t}\,P23\,s^5+\frac{1}{2}\,i\,a\,c2^2\,e^{i\,t}\,P23\,s^5+$$
$$\frac{3}{4}\,i\,a\,c1^2\,e^{2\,i\,t}\,P23\,s^5-\frac{3}{2}\,a\,c1\,c2\,e^{2\,i\,t}\,P23\,s^5-\frac{3}{4}\,i\,a\,c2^2\,e^{2\,i\,t}\,P23\,s^5-\frac{1}{4}\,i\,d1^2\,G\,P23\,s^5-$$
$$\frac{1}{2}\,d1\,d2\,G\,P23\,s^5+\frac{1}{4}\,i\,d2^2\,G\,P23\,s^5+\frac{1}{2}\,i\,d1^2\,e^{i\,t}\,G\,P23\,s^5+\frac{1}{2}\,i\,d2^2\,e^{i\,t}\,G\,P23\,s^5+$$
$$\frac{3}{4}\,i\,d1^2\,e^{2\,i\,t}\,G\,P23\,s^5-\frac{3}{2}\,d1\,d2\,e^{2\,i\,t}\,G\,P23\,s^5-\frac{3}{4}\,i\,d2^2\,e^{2\,i\,t}\,G\,P23\,s^5-a\,c2\,D1\,p33\,s^5+$$
$$(1+i)\,a\,c1\,D2\,p33\,s^5+i\,a\,c2\,D2\,p33\,s^5+\frac{1}{2}\,i\,a\,c1\,D1\,e^{-i\,t}\,p33\,s^5+\frac{1}{2}\,a\,c2\,D1\,e^{-i\,t}\,p33\,s^5+$$
$$\left(1+\frac{i}{2}\right)a\,c1\,D2\,e^{-i\,t}\,p33\,s^5+\left(\frac{1}{2}-i\right)a\,c2\,D2\,e^{-i\,t}\,p33\,s^5-\frac{1}{2}\,i\,a\,c1\,D1\,e^{i\,t}\,p33\,s^5+$$
$$\frac{1}{2}\,a\,c2\,D1\,e^{i\,t}\,p33\,s^5+\frac{1}{2}\,i\,a\,c1\,D2\,e^{i\,t}\,p33\,s^5-\frac{1}{2}\,a\,c2\,D2\,e^{i\,t}\,p33\,s^5-i\,C1\,d1\,G\,p33\,s^5-$$
$$C2\,d1\,G\,p33\,s^5+C1\,d2\,G\,p33\,s^5-i\,C2\,d2\,G\,p33\,s^5-i\,C1\,d1\,e^{-i\,t}\,G\,p33\,s^5-C2\,d1\,e^{-i\,t}\,G\,p33\,s^5-$$
$$C1\,d2\,e^{-i\,t}\,G\,p33\,s^5+i\,C2\,d2\,e^{-i\,t}\,G\,p33\,s^5+\frac{1}{2}\,i\,a\,c1\,d1\,P33\,s^5+\frac{1}{2}\,a\,c2\,d1\,P33\,s^5+$$
$$\frac{1}{2}\,a\,c1\,d2\,P33\,s^5-\frac{1}{2}\,i\,a\,c2\,d2\,P33\,s^5-i\,a\,c1\,d1\,e^{i\,t}\,P33\,s^5-i\,a\,c2\,d2\,e^{i\,t}\,P33\,s^5-$$
$$\frac{3}{2}\,i\,a\,c1\,d1\,e^{2\,i\,t}\,P33\,s^5+\frac{3}{2}\,a\,c2\,d1\,e^{2\,i\,t}\,P33\,s^5+\frac{3}{2}\,a\,c1\,d2\,e^{2\,i\,t}\,P33\,s^5+\frac{3}{2}\,i\,a\,c2\,d2\,e^{2\,i\,t}\,P33\,s^5-$$
$$a\,c1\,p23\,P23\,s^7+i\,a\,c2\,p23\,P23\,s^7-a\,c1\,e^{i\,t}\,p23\,P23\,s^7-i\,a\,c2\,e^{i\,t}\,p23\,P23\,s^7-d1\,G\,P23\,p33\,s^7+$$
$$i\,d2\,G\,P23\,p33\,s^7-d1\,e^{i\,t}\,G\,P23\,p33\,s^7-i\,d2\,e^{i\,t}\,G\,P23\,p33\,s^7+a\,d1\,p23\,P33\,s^7-$$
$$i\,a\,d2\,p23\,P33\,s^7+a\,d1\,e^{i\,t}\,p23\,P33\,s^7+i\,a\,d2\,e^{i\,t}\,p23\,P33\,s^7+a\,c1\,p33\,P33\,s^7-$$
$$i\,a\,c2\,p33\,P33\,s^7+a\,c1\,e^{i\,t}\,p33\,P33\,s^7+i\,a\,c2\,e^{i\,t}\,p33\,P33\,s^7+\frac{s^3\,z23}{2}-a\,c1\,C1\,s^5\,z23-$$
$$2\,i\,a\,C1\,c2\,s^5\,z23+2\,i\,a\,c1\,C2\,s^5\,z23-a\,c2\,C2\,s^5\,z23+a\,d1\,D1\,s^5\,z23+i\,a\,D1\,d2\,s^5\,z23-$$
$$2\,i\,a\,d1\,D2\,s^5\,z23+(1+i)\,a\,d2\,D2\,s^5\,z23+\frac{1}{2}\,a\,c1\,C1\,e^{-i\,t}\,s^5\,z23-\frac{1}{2}\,i\,a\,C1\,c2\,e^{-i\,t}\,s^5\,z23-$$
$$\frac{1}{2}\,i\,a\,c1\,C2\,e^{-i\,t}\,s^5\,z23-\frac{1}{2}\,a\,c2\,C2\,e^{-i\,t}\,s^5\,z23-\left(\frac{1}{2}-\frac{i}{2}\right)a\,d1\,D2\,e^{-i\,t}\,s^5\,z23+$$
$$\left(\frac{1}{2}+\frac{i}{2}\right)a\,d2\,D2\,e^{-i\,t}\,s^5\,z23+\frac{1}{2}\,a\,c1\,C1\,e^{i\,t}\,s^5\,z23+\frac{1}{2}\,i\,a\,C1\,c2\,e^{i\,t}\,s^5\,z23+$$
$$\frac{1}{2}\,i\,a\,c1\,C2\,e^{i\,t}\,s^5\,z23-\frac{1}{2}\,a\,c2\,C2\,e^{i\,t}\,s^5\,z23-a\,d1\,D1\,e^{i\,t}\,s^5\,z23-i\,a\,D1\,d2\,e^{i\,t}\,s^5\,z23+$$

$$\left(\frac{1}{2}-\frac{i}{2}\right) a\, d1\, D2\, e^{i t}\, s^5\, z23+\left(\frac{1}{2}+\frac{i}{2}\right) a\, d2\, D2\, e^{i t}\, s^5\, z23-2\, i\, a\, C1\, e^{-i t}\, p23\, s^7\, z23-$$
$$2\, a\, C2\, e^{-i t}\, p23\, s^7\, z23+2\, i\, a\, c1\, e^{i t}\, P23\, s^7\, z23-2\, a\, c2\, e^{i t}\, P23\, s^7\, z23-i\, a\, D1\, p33\, s^7\, z23+$$
$$i\, a\, D2\, p33\, s^7\, z23+i\, a\, D1\, e^{-i t}\, p33\, s^7\, z23+\left(2+i\right) a\, D2\, e^{-i t}\, p33\, s^7\, z23-2\, i\, a\, d1\, e^{i t}\, P33\, s^7\, z23+$$
$$2\, a\, d2\, e^{i t}\, P33\, s^7\, z23-2\, a\, p23\, P23\, s^9\, z23+2\, a\, p33\, P33\, s^9\, z23+\frac{1}{2} a\, C1\, s^7\, z23^2+\frac{1}{2} i\, a\, C2\, s^7\, z23^2-$$
$$\frac{1}{2} a\, C1\, e^{-i t}\, s^7\, z23^2+\frac{1}{2} i\, a\, C2\, e^{-i t}\, s^7\, z23^2+i\, a\, P23\, s^9\, z23^2+\frac{1}{2} a\, c1^2\, s^5\, Z23-i\, a\, c1\, c2\, s^5\, Z23-$$
$$\frac{1}{2} a\, c2^2\, s^5\, Z23-\frac{1}{2} a\, c1^2\, e^{2 i t}\, s^5\, Z23-i\, a\, c1\, c2\, e^{2 i t}\, s^5\, Z23+\frac{1}{2} a\, c2^2\, e^{2 i t}\, s^5\, Z23+$$
$$\frac{1}{2} d1^2\, G\, s^5\, Z23-i\, d1\, d2\, G\, s^5\, Z23-\frac{1}{2} d2^2\, G\, s^5\, Z23-\frac{1}{2} d1^2\, e^{2 i t}\, G\, s^5\, Z23-i\, d1\, d2\, e^{2 i t}\, G\, s^5\, Z23+$$
$$\frac{1}{2} d2^2\, e^{2 i t}\, G\, s^5\, Z23-i\, a\, c1\, p23\, s^7\, Z23-a\, c2\, p23\, s^7\, Z23-i\, a\, c1\, e^{i t}\, p23\, s^7\, Z23+$$
$$a\, c2\, e^{i t}\, p23\, s^7\, Z23-i\, d1\, G\, p33\, s^7\, Z23-d2\, G\, p33\, s^7\, Z23-i\, d1\, e^{i t}\, G\, p33\, s^7\, Z23+$$
$$d2\, e^{i t}\, G\, p33\, s^7\, Z23+a\, c1\, s^7\, z23\, Z23-i\, a\, c2\, s^7\, z23\, Z23-a\, c1\, e^{i t}\, s^7\, z23\, Z23-$$
$$i\, a\, c2\, e^{i t}\, s^7\, z23\, Z23-2\, i\, a\, p23\, s^9\, z23\, Z23+a\, c1\, D1\, s^5\, z33+i\, a\, c2\, D1\, s^5\, z33-2\, i\, a\, c1\, D2\, s^5\, z33+$$
$$\left(1+i\right) a\, c2\, D2\, s^5\, z33-\left(\frac{1}{2}-\frac{i}{2}\right) a\, c1\, D2\, e^{-i t}\, s^5\, z33+\left(\frac{1}{2}+\frac{i}{2}\right) a\, c2\, D2\, e^{-i t}\, s^5\, z33-$$
$$a\, c1\, D1\, e^{i t}\, s^5\, z33-i\, a\, c2\, D1\, e^{i t}\, s^5\, z33+\left(\frac{1}{2}-\frac{i}{2}\right) a\, c1\, D2\, e^{i t}\, s^5\, z33+$$
$$\left(\frac{1}{2}+\frac{i}{2}\right) a\, c2\, D2\, e^{i t}\, s^5\, z33-C1\, d1\, G\, s^5\, z33+2\, i\, C2\, d1\, G\, s^5\, z33-2\, i\, C1\, d2\, G\, s^5\, z33-$$
$$C2\, d2\, G\, s^5\, z33+\frac{1}{2} C1\, d1\, e^{-i t}\, G\, s^5\, z33-\frac{1}{2} i\, C2\, d1\, e^{-i t}\, G\, s^5\, z33-\frac{1}{2} i\, C1\, d2\, e^{-i t}\, G\, s^5\, z33-$$
$$\frac{1}{2} C2\, d2\, e^{-i t}\, G\, s^5\, z33+\frac{1}{2} C1\, d1\, e^{i t}\, G\, s^5\, z33+\frac{1}{2} i\, C2\, d1\, e^{i t}\, G\, s^5\, z33+\frac{1}{2} i\, C1\, d2\, e^{i t}\, G\, s^5\, z33-$$
$$\frac{1}{2} C2\, d2\, e^{i t}\, G\, s^5\, z33-i\, a\, D1\, p23\, s^7\, z33+i\, a\, D2\, p23\, s^7\, z33+i\, a\, D1\, e^{-i t}\, p23\, s^7\, z33+$$
$$\left(2+i\right) a\, D2\, e^{-i t}\, p23\, s^7\, z33+2\, i\, d1\, e^{i t}\, G\, P23\, s^7\, z33-2\, d2\, e^{i t}\, G\, P23\, s^7\, z33-$$
$$2\, i\, C1\, e^{-i t}\, G\, p33\, s^7\, z33-2\, C2\, e^{-i t}\, G\, p33\, s^7\, z33-2\, i\, a\, c1\, e^{i t}\, P33\, s^7\, z33+2\, a\, c2\, e^{i t}\, P33\, s^7\, z33-$$
$$2\, G\, P23\, p33\, s^9\, z33+2\, a\, p23\, P33\, s^9\, z33-a\, D1\, s^7\, z23\, z33-i\, a\, D2\, s^7\, z23\, z33+$$
$$a\, D1\, e^{-i t}\, s^7\, z23\, z33-i\, a\, D2\, e^{-i t}\, s^7\, z23\, z33-2\, i\, a\, P33\, s^9\, z23\, z33+d1\, G\, s^7\, Z23\, z33-$$
$$i\, d2\, G\, s^7\, Z23\, z33-d1\, e^{i t}\, G\, s^7\, Z23\, z33-i\, d2\, e^{i t}\, G\, s^7\, Z23\, z33-2\, i\, G\, p33\, s^9\, Z23\, z33+$$
$$\frac{1}{2} C1\, G\, s^7\, z33^2+\frac{1}{2} i\, C2\, G\, s^7\, z33^2-\frac{1}{2} C1\, e^{-i t}\, G\, s^7\, z33^2+\frac{1}{2} i\, C2\, e^{-i t}\, G\, s^7\, z33^2+i\, G\, P23\, s^9\, z33^2-$$
$$a\, c1\, d1\, s^5\, Z33+i\, a\, c2\, d1\, s^5\, Z33+i\, a\, c1\, d2\, s^5\, Z33+a\, c2\, d2\, s^5\, Z33+a\, c1\, d1\, e^{2 i t}\, s^5\, Z33+$$
$$i\, a\, c2\, d1\, e^{2 i t}\, s^5\, Z33+i\, a\, c1\, d2\, e^{2 i t}\, s^5\, Z33-a\, c2\, d2\, e^{2 i t}\, s^5\, Z33+i\, a\, d1\, p23\, s^7\, Z33+$$
$$a\, d2\, p23\, s^7\, Z33+i\, a\, d1\, e^{i t}\, p23\, s^7\, Z33-a\, d2\, e^{i t}\, p23\, s^7\, Z33+i\, a\, c1\, p33\, s^7\, Z33+a\, c2\, p33\, s^7\, Z33+$$
$$i\, a\, c1\, e^{i t}\, p33\, s^7\, Z33-a\, c2\, e^{i t}\, p33\, s^7\, Z33-a\, d1\, s^7\, z23\, Z33+i\, a\, d2\, s^7\, z23\, Z33+$$
$$a\, d1\, e^{i t}\, s^7\, z23\, Z33+i\, a\, d2\, e^{i t}\, s^7\, z23\, Z33+2\, i\, a\, p33\, s^9\, z23\, Z33-a\, c1\, s^7\, z33\, Z33+$$
$$i\, a\, c2\, s^7\, z33\, Z33+a\, c1\, e^{i t}\, s^7\, z33\, Z33+i\, a\, c2\, e^{i t}\, s^7\, z33\, Z33+2\, i\, a\, p23\, s^9\, z33\, Z33$$

In[•]:=
```
Collect[%, s]
```

Out[•]=
$$\left(\frac{1}{2} c1\, e^{i t}+\frac{1}{2} i\, c2\, e^{i t}\right) s+$$
$$s^3\left(-\frac{1}{8} a\, c1^2\, C1-\frac{1}{4} i\, a\, c1\, C1\, c2-\frac{3}{8} a\, C1\, c2^2+\frac{3}{8} i\, a\, c1^2\, C2+\frac{1}{4} a\, c1\, c2\, C2+\frac{1}{8} i\, a\, c2^2\, C2+\right.$$

$$\frac{3}{4}\,a\,c1\,d1\,D1-\frac{1}{4}\,i\,a\,c2\,d1\,D1-\frac{1}{4}\,i\,a\,c1\,D1\,d2+\frac{1}{4}\,a\,c2\,D1\,d2-\left(\frac{1}{2}+\frac{3\,i}{4}\right)a\,c1\,d1\,D2-$$
$$\left(\frac{1}{4}-\frac{i}{2}\right)a\,c2\,d1\,D2-\left(\frac{1}{4}-\frac{i}{2}\right)a\,c1\,d2\,D2+\left(\frac{1}{2}-\frac{i}{4}\right)a\,c2\,d2\,D2+\frac{3}{8}\,a\,c1^2\,C1\,e^{-i\,t}-$$
$$\frac{3}{4}\,i\,a\,c1\,C1\,c2\,e^{-i\,t}-\frac{3}{8}\,a\,C1\,c2^2\,e^{-i\,t}-\frac{3}{8}\,i\,a\,c1^2\,C2\,e^{-i\,t}-\frac{3}{4}\,a\,c1\,c2\,C2\,e^{-i\,t}+$$
$$\frac{3}{8}\,i\,a\,c2^2\,C2\,e^{-i\,t}-\frac{1}{4}\,a\,c1\,d1\,D1\,e^{-i\,t}+\frac{1}{4}\,i\,a\,c2\,d1\,D1\,e^{-i\,t}+\frac{1}{4}\,i\,a\,c1\,D1\,d2\,e^{-i\,t}+$$
$$\frac{1}{4}\,a\,c2\,D1\,d2\,e^{-i\,t}-\left(\frac{1}{2}-\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,e^{-i\,t}+\left(\frac{3}{4}+\frac{i}{2}\right)a\,c2\,d1\,D2\,e^{-i\,t}+$$
$$\left(\frac{3}{4}+\frac{i}{2}\right)a\,c1\,d2\,D2\,e^{-i\,t}+\left(\frac{1}{2}-\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,e^{-i\,t}-\frac{3}{8}\,a\,c1^2\,C1\,e^{i\,t}-\frac{5}{4}\,i\,a\,c1\,C1\,c2\,e^{i\,t}+$$
$$\frac{7}{8}\,a\,C1\,c2^2\,e^{i\,t}+\frac{7}{8}\,i\,a\,c1^2\,C2\,e^{i\,t}-\frac{5}{4}\,a\,c1\,c2\,C2\,e^{i\,t}-\frac{3}{8}\,i\,a\,c2^2\,C2\,e^{i\,t}+$$
$$\frac{1}{4}\,a\,c1\,d1\,D1\,e^{i\,t}+\frac{3}{4}\,i\,a\,c2\,d1\,D1\,e^{i\,t}+\frac{3}{4}\,i\,a\,c1\,D1\,d2\,e^{i\,t}-\frac{5}{4}\,a\,c2\,D1\,d2\,e^{i\,t}+$$
$$\left(\frac{1}{2}-\frac{7\,i}{4}\right)a\,c1\,d1\,D2\,e^{i\,t}+\left(\frac{5}{4}+\frac{i}{2}\right)a\,c2\,d1\,D2\,e^{i\,t}+\left(\frac{5}{4}+\frac{i}{2}\right)a\,c1\,d2\,D2\,e^{i\,t}-$$
$$\left(\frac{1}{2}-\frac{3\,i}{4}\right)a\,c2\,d2\,D2\,e^{i\,t}+\frac{1}{8}\,a\,c1^2\,C1\,e^{2\,i\,t}+\frac{1}{4}\,i\,a\,c1\,C1\,c2\,e^{2\,i\,t}-\frac{1}{8}\,a\,C1\,c2^2\,e^{2\,i\,t}+$$
$$\frac{1}{8}\,i\,a\,c1^2\,C2\,e^{2\,i\,t}-\frac{1}{4}\,a\,c1\,c2\,C2\,e^{2\,i\,t}-\frac{1}{8}\,i\,a\,c2^2\,C2\,e^{2\,i\,t}-\frac{3}{4}\,a\,c1\,d1\,D1\,e^{2\,i\,t}-$$
$$\frac{3}{4}\,i\,a\,c2\,d1\,D1\,e^{2\,i\,t}-\frac{3}{4}\,i\,a\,c1\,D1\,d2\,e^{2\,i\,t}+\frac{3}{4}\,a\,c2\,D1\,d2\,e^{2\,i\,t}+\left(\frac{1}{2}-\frac{i}{4}\right)a\,c1\,d1\,D2\,e^{2\,i\,t}+$$
$$\left(\frac{1}{4}+\frac{i}{2}\right)a\,c2\,d1\,D2\,e^{2\,i\,t}+\left(\frac{1}{4}+\frac{i}{2}\right)a\,c1\,d2\,D2\,e^{2\,i\,t}-\left(\frac{1}{2}-\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{2\,i\,t}-$$
$$\frac{1}{8}\,C1\,d1^2\,G+\frac{3}{8}\,i\,C2\,d1^2\,G-\frac{1}{4}\,i\,C1\,d1\,d2\,G+\frac{1}{4}\,C2\,d1\,d2\,G-\frac{3}{8}\,C1\,d2^2\,G+\frac{1}{8}\,i\,C2\,d2^2\,G+$$
$$\frac{3}{8}\,C1\,d1^2\,e^{-i\,t}\,G-\frac{3}{8}\,i\,C2\,d1^2\,e^{-i\,t}\,G-\frac{3}{4}\,i\,C1\,d1\,d2\,e^{-i\,t}\,G-\frac{3}{4}\,C2\,d1\,d2\,e^{-i\,t}\,G-$$
$$\frac{3}{8}\,C1\,d2^2\,e^{-i\,t}\,G+\frac{3}{8}\,i\,C2\,d2^2\,e^{-i\,t}\,G-\frac{3}{8}\,C1\,d1^2\,e^{i\,t}\,G+\frac{7}{8}\,i\,C2\,d1^2\,e^{i\,t}\,G-\frac{5}{4}\,i\,C1\,d1\,d2\,e^{i\,t}\,G-$$
$$\frac{5}{4}\,C2\,d1\,d2\,e^{i\,t}\,G+\frac{7}{8}\,C1\,d2^2\,e^{i\,t}\,G-\frac{3}{8}\,i\,C2\,d2^2\,e^{i\,t}\,G+\frac{1}{8}\,C1\,d1^2\,e^{2\,i\,t}\,G+\frac{1}{8}\,i\,C2\,d1^2\,e^{2\,i\,t}\,G+$$
$$\frac{1}{4}\,i\,C1\,d1\,d2\,e^{2\,i\,t}\,G-\frac{1}{4}\,C2\,d1\,d2\,e^{2\,i\,t}\,G-\frac{1}{8}\,C1\,d2^2\,e^{2\,i\,t}\,G-\frac{1}{8}\,i\,C2\,d2^2\,e^{2\,i\,t}\,G+\frac{i\,p23}{2}+\frac{z23}{2}\Bigg)+$$
$$s^5\Bigg(-i\,a\,c1\,C1\,p23+a\,C1\,c2\,p23-a\,c1\,C2\,p23-i\,a\,c2\,C2\,p23-a\,D1\,d2\,p23+$$
$$(1+i)\,a\,d1\,D2\,p23+i\,a\,d2\,D2\,p23-i\,a\,c1\,C1\,e^{-i\,t}\,p23-a\,C1\,c2\,e^{-i\,t}\,p23-a\,c1\,C2\,e^{-i\,t}\,p23+$$
$$i\,a\,c2\,C2\,e^{-i\,t}\,p23+\frac{1}{2}\,i\,a\,d1\,D1\,e^{-i\,t}\,p23+\frac{1}{2}\,a\,D1\,d2\,e^{-i\,t}\,p23+\left(1+\frac{i}{2}\right)a\,d1\,D2\,e^{-i\,t}\,p23+$$
$$\left(\frac{1}{2}-i\right)a\,d2\,D2\,e^{-i\,t}\,p23-\frac{1}{2}\,i\,a\,d1\,D1\,e^{i\,t}\,p23+\frac{1}{2}\,a\,D1\,d2\,e^{i\,t}\,p23+\frac{1}{2}\,i\,a\,d1\,D2\,e^{i\,t}\,p23-$$
$$\frac{1}{2}\,a\,d2\,D2\,e^{i\,t}\,p23-\frac{1}{4}\,i\,a\,c1^2\,P23-\frac{1}{2}\,a\,c1\,c2\,P23+\frac{1}{4}\,i\,a\,c2^2\,P23+\frac{1}{2}\,i\,a\,c1^2\,e^{i\,t}\,P23+$$
$$\frac{1}{2}\,i\,a\,c2^2\,e^{i\,t}\,P23+\frac{3}{4}\,i\,a\,c1^2\,e^{2\,i\,t}\,P23-\frac{3}{2}\,a\,c1\,c2\,e^{2\,i\,t}\,P23-\frac{3}{4}\,i\,a\,c2^2\,e^{2\,i\,t}\,P23-$$

$$\frac{1}{4}\,i\,d1^2\,G\,P23-\frac{1}{2}\,d1\,d2\,G\,P23+\frac{1}{4}\,i\,d2^2\,G\,P23+\frac{1}{2}\,i\,d1^2\,e^{i\,t}\,G\,P23+\frac{1}{2}\,i\,d2^2\,e^{i\,t}\,G\,P23+$$
$$\frac{3}{4}\,i\,d1^2\,e^{2\,i\,t}\,G\,P23-\frac{3}{2}\,d1\,d2\,e^{2\,i\,t}\,G\,P23-\frac{3}{4}\,i\,d2^2\,e^{2\,i\,t}\,G\,P23-a\,c2\,D1\,p33+$$
$$\left(1+i\right)\,a\,c1\,D2\,p33+i\,a\,c2\,D2\,p33+\frac{1}{2}\,i\,a\,c1\,D1\,e^{-i\,t}\,p33+\frac{1}{2}\,a\,c2\,D1\,e^{-i\,t}\,p33+$$
$$\left(1+\frac{i}{2}\right)\,a\,c1\,D2\,e^{-i\,t}\,p33+\left(\frac{1}{2}-i\right)\,a\,c2\,D2\,e^{-i\,t}\,p33-\frac{1}{2}\,i\,a\,c1\,D1\,e^{i\,t}\,p33+$$
$$\frac{1}{2}\,a\,c2\,D1\,e^{i\,t}\,p33+\frac{1}{2}\,i\,a\,c1\,D2\,e^{i\,t}\,p33-\frac{1}{2}\,a\,c2\,D2\,e^{i\,t}\,p33-i\,C1\,d1\,G\,p33-C2\,d1\,G\,p33+$$
$$C1\,d2\,G\,p33-i\,C2\,d2\,G\,p33-i\,C1\,d1\,e^{-i\,t}\,G\,p33-C2\,d1\,e^{-i\,t}\,G\,p33-C1\,d2\,e^{-i\,t}\,G\,p33+$$
$$i\,C2\,d2\,e^{-i\,t}\,G\,p33+\frac{1}{2}\,i\,a\,c1\,d1\,P33+\frac{1}{2}\,a\,c2\,d1\,P33+\frac{1}{2}\,a\,c1\,d2\,P33-\frac{1}{2}\,i\,a\,c2\,d2\,P33-$$
$$i\,a\,c1\,d1\,e^{i\,t}\,P33-i\,a\,c2\,d2\,e^{i\,t}\,P33-\frac{3}{2}\,i\,a\,c1\,d1\,e^{2\,i\,t}\,P33+\frac{3}{2}\,a\,c2\,d1\,e^{2\,i\,t}\,P33+$$
$$\frac{3}{2}\,a\,c1\,d2\,e^{2\,i\,t}\,P33+\frac{3}{2}\,i\,a\,c2\,d2\,e^{2\,i\,t}\,P33-a\,c1\,C1\,z23-2\,i\,a\,C1\,c2\,z23+2\,i\,a\,c1\,C2\,z23-$$
$$a\,c2\,C2\,z23+a\,d1\,D1\,z23+i\,a\,D1\,d2\,z23-2\,i\,a\,d1\,D2\,z23+\left(1+i\right)\,a\,d2\,D2\,z23+$$
$$\frac{1}{2}\,a\,c1\,C1\,e^{-i\,t}\,z23-\frac{1}{2}\,i\,a\,C1\,c2\,e^{-i\,t}\,z23-\frac{1}{2}\,i\,a\,c1\,C2\,e^{-i\,t}\,z23-\frac{1}{2}\,a\,c2\,C2\,e^{-i\,t}\,z23-$$
$$\left(\frac{1}{2}-\frac{i}{2}\right)\,a\,d1\,D2\,e^{-i\,t}\,z23+\left(\frac{1}{2}+\frac{i}{2}\right)\,a\,d2\,D2\,e^{-i\,t}\,z23+\frac{1}{2}\,a\,c1\,C1\,e^{i\,t}\,z23+$$
$$\frac{1}{2}\,i\,a\,C1\,c2\,e^{i\,t}\,z23+\frac{1}{2}\,i\,a\,c1\,C2\,e^{i\,t}\,z23-\frac{1}{2}\,a\,c2\,C2\,e^{i\,t}\,z23-a\,d1\,D1\,e^{i\,t}\,z23-$$
$$i\,a\,D1\,d2\,e^{i\,t}\,z23+\left(\frac{1}{2}-\frac{i}{2}\right)\,a\,d1\,D2\,e^{i\,t}\,z23+\left(\frac{1}{2}+\frac{i}{2}\right)\,a\,d2\,D2\,e^{i\,t}\,z23+\frac{1}{2}\,a\,c1^2\,Z23-$$
$$i\,a\,c1\,c2\,Z23-\frac{1}{2}\,a\,c2^2\,Z23-\frac{1}{2}\,a\,c1^2\,e^{2\,i\,t}\,Z23-i\,a\,c1\,c2\,e^{2\,i\,t}\,Z23+\frac{1}{2}\,a\,c2^2\,e^{2\,i\,t}\,Z23+$$
$$\frac{1}{2}\,d1^2\,G\,Z23-i\,d1\,d2\,G\,Z23-\frac{1}{2}\,d2^2\,G\,Z23-\frac{1}{2}\,d1^2\,e^{2\,i\,t}\,G\,Z23-i\,d1\,d2\,e^{2\,i\,t}\,G\,Z23+$$
$$\frac{1}{2}\,d2^2\,e^{2\,i\,t}\,G\,Z23+a\,c1\,D1\,z33+i\,a\,c2\,D1\,z33-2\,i\,a\,c1\,D2\,z33+\left(1+i\right)\,a\,c2\,D2\,z33-$$
$$\left(\frac{1}{2}-\frac{i}{2}\right)\,a\,c1\,D2\,e^{-i\,t}\,z33+\left(\frac{1}{2}+\frac{i}{2}\right)\,a\,c2\,D2\,e^{-i\,t}\,z33-a\,c1\,D1\,e^{i\,t}\,z33-i\,a\,c2\,D1\,e^{i\,t}\,z33+$$
$$\left(\frac{1}{2}-\frac{i}{2}\right)\,a\,c1\,D2\,e^{i\,t}\,z33+\left(\frac{1}{2}+\frac{i}{2}\right)\,a\,c2\,D2\,e^{i\,t}\,z33-C1\,d1\,G\,z33+2\,i\,C2\,d1\,G\,z33-$$
$$2\,i\,C1\,d2\,G\,z33-C2\,d2\,G\,z33+\frac{1}{2}\,C1\,d1\,e^{-i\,t}\,G\,z33-\frac{1}{2}\,i\,C2\,d1\,e^{-i\,t}\,G\,z33-$$
$$\frac{1}{2}\,i\,C1\,d2\,e^{-i\,t}\,G\,z33-\frac{1}{2}\,C2\,d2\,e^{-i\,t}\,G\,z33+\frac{1}{2}\,C1\,d1\,e^{i\,t}\,G\,z33+\frac{1}{2}\,i\,C2\,d1\,e^{i\,t}\,G\,z33+$$
$$\frac{1}{2}\,i\,C1\,d2\,e^{i\,t}\,G\,z33-\frac{1}{2}\,C2\,d2\,e^{i\,t}\,G\,z33-a\,c1\,d1\,Z33+i\,a\,c2\,d1\,Z33+i\,a\,c1\,d2\,Z33+$$
$$a\,c2\,d2\,Z33+a\,c1\,d1\,e^{2\,i\,t}\,Z33+i\,a\,c2\,d1\,e^{2\,i\,t}\,Z33+i\,a\,c1\,d2\,e^{2\,i\,t}\,Z33-a\,c2\,d2\,e^{2\,i\,t}\,Z33\Big)+$$
$$s^7\,\Big(-a\,c1\,p23\,P23+i\,a\,c2\,p23\,P23-a\,c1\,e^{i\,t}\,p23\,P23-i\,a\,c2\,e^{i\,t}\,p23\,P23-d1\,G\,P23\,p33+$$
$$i\,d2\,G\,P23\,p33-d1\,e^{i\,t}\,G\,P23\,p33-i\,d2\,e^{i\,t}\,G\,P23\,p33+a\,d1\,p23\,P33-i\,a\,d2\,p23\,P33+$$
$$a\,d1\,e^{i\,t}\,p23\,P33+i\,a\,d2\,e^{i\,t}\,p23\,P33+a\,c1\,p33\,P33-i\,a\,c2\,p33\,P33+a\,c1\,e^{i\,t}\,p33\,P33+$$

$$
\begin{aligned}
&\mathrm{i}\, a\, c2\, e^{\mathrm{i} t}\, p33\, P33 - 2\,\mathrm{i}\, a\, C1\, e^{-\mathrm{i} t}\, p23\, z23 - 2\, a\, C2\, e^{-\mathrm{i} t}\, p23\, z23 + 2\,\mathrm{i}\, a\, c1\, e^{\mathrm{i} t}\, P23\, z23 - \\
&2\, a\, c2\, e^{\mathrm{i} t}\, P23\, z23 - \mathrm{i}\, a\, D1\, p33\, z23 + \mathrm{i}\, a\, D2\, p33\, z23 + \mathrm{i}\, a\, D1\, e^{-\mathrm{i} t}\, p33\, z23 + \\
&\left(2+\mathrm{i}\right) a\, D2\, e^{-\mathrm{i} t}\, p33\, z23 - 2\,\mathrm{i}\, a\, d1\, e^{\mathrm{i} t}\, P33\, z23 + 2\, a\, d2\, e^{\mathrm{i} t}\, P33\, z23 + \frac{1}{2} a\, C1\, z23^2 + \\
&\frac{1}{2}\,\mathrm{i}\, a\, C2\, z23^2 - \frac{1}{2} a\, C1\, e^{-\mathrm{i} t}\, z23^2 + \frac{1}{2}\,\mathrm{i}\, a\, C2\, e^{-\mathrm{i} t}\, z23^2 - \mathrm{i}\, a\, c1\, p23\, Z23 - a\, c2\, p23\, Z23 - \\
&\mathrm{i}\, a\, c1\, e^{\mathrm{i} t}\, p23\, Z23 + a\, c2\, e^{\mathrm{i} t}\, p23\, Z23 - \mathrm{i}\, d1\, G\, p33\, Z23 - d2\, G\, p33\, Z23 - \mathrm{i}\, d1\, e^{\mathrm{i} t}\, G\, p33\, Z23 + \\
&d2\, e^{\mathrm{i} t}\, G\, p33\, Z23 + a\, c1\, z23\, Z23 - \mathrm{i}\, a\, c2\, z23\, Z23 - a\, c1\, e^{\mathrm{i} t}\, z23\, Z23 - \mathrm{i}\, a\, c2\, e^{\mathrm{i} t}\, z23\, Z23 - \\
&\mathrm{i}\, a\, D1\, p23\, z33 + \mathrm{i}\, a\, D2\, p23\, z33 + \mathrm{i}\, a\, D1\, e^{-\mathrm{i} t}\, p23\, z33 + \left(2+\mathrm{i}\right) a\, D2\, e^{-\mathrm{i} t}\, p23\, z33 + \\
&2\,\mathrm{i}\, d1\, e^{\mathrm{i} t}\, G\, P23\, z33 - 2\, d2\, e^{\mathrm{i} t}\, G\, P23\, z33 - 2\,\mathrm{i}\, C1\, e^{-\mathrm{i} t}\, G\, p33\, z33 - 2\, C2\, e^{-\mathrm{i} t}\, G\, p33\, z33 - \\
&2\,\mathrm{i}\, a\, c1\, e^{\mathrm{i} t}\, P33\, z33 + 2\, a\, c2\, e^{\mathrm{i} t}\, P33\, z33 - a\, D1\, z23\, z33 - \mathrm{i}\, a\, D2\, z23\, z33 + a\, D1\, e^{-\mathrm{i} t}\, z23\, z33 - \\
&\mathrm{i}\, a\, D2\, e^{-\mathrm{i} t}\, z23\, z33 + d1\, G\, Z23\, z33 - \mathrm{i}\, d2\, G\, Z23\, z33 - d1\, e^{\mathrm{i} t}\, G\, Z23\, z33 - \mathrm{i}\, d2\, e^{\mathrm{i} t}\, G\, Z23\, z33 + \\
&\frac{1}{2} C1\, G\, z33^2 + \frac{1}{2}\,\mathrm{i}\, C2\, G\, z33^2 - \frac{1}{2} C1\, e^{-\mathrm{i} t}\, G\, z33^2 + \frac{1}{2}\,\mathrm{i}\, C2\, e^{-\mathrm{i} t}\, G\, z33^2 + \mathrm{i}\, a\, d1\, p23\, Z33 + \\
&a\, d2\, p23\, Z33 + \mathrm{i}\, a\, d1\, e^{\mathrm{i} t}\, p23\, Z33 - a\, d2\, e^{\mathrm{i} t}\, p23\, Z33 + \mathrm{i}\, a\, c1\, p33\, Z33 + a\, c2\, p33\, Z33 + \\
&\mathrm{i}\, a\, c1\, e^{\mathrm{i} t}\, p33\, Z33 - a\, c2\, e^{\mathrm{i} t}\, p33\, Z33 - a\, d1\, z23\, Z33 + \mathrm{i}\, a\, d2\, z23\, Z33 + a\, d1\, e^{\mathrm{i} t}\, z23\, Z33 + \\
&\mathrm{i}\, a\, d2\, e^{\mathrm{i} t}\, z23\, Z33 - a\, c1\, z33\, Z33 + \mathrm{i}\, a\, c2\, z33\, Z33 + a\, c1\, e^{\mathrm{i} t}\, z33\, Z33 + \mathrm{i}\, a\, c2\, e^{\mathrm{i} t}\, z33\, Z33\Big) + \\
s^9 \Big(&-2\, a\, p23\, P23\, z23 + 2\, a\, p33\, P33\, z23 + \mathrm{i}\, a\, P23\, z23^2 - 2\,\mathrm{i}\, a\, p23\, z23\, Z23 - \\
&2\, G\, P23\, p33\, z33 + 2\, a\, p23\, P33\, z33 - 2\,\mathrm{i}\, a\, P33\, z23\, z33 - \\
&2\,\mathrm{i}\, G\, p33\, Z23\, z33 + \mathrm{i}\, G\, P23\, z33^2 + 2\,\mathrm{i}\, a\, p33\, z23\, Z33 + 2\,\mathrm{i}\, a\, p23\, z33\, Z33\Big)
\end{aligned}
$$

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$$
\begin{aligned}
\text{dz2trunc} := {} & \left(\frac{1}{2}\, i\, c1\, e^{i t} - \frac{1}{2}\, c2\, e^{i t}\right) s + \\
& s^3 \left(-\frac{1}{8}\, i\, a\, c1^2\, C1 + \frac{1}{4}\, a\, c1\, C1\, c2 - \frac{3}{8}\, i\, a\, C1\, c2^2 - \frac{3}{8}\, a\, c1^2\, C2 + \frac{1}{4}\, i\, a\, c1\, c2\, C2 - \frac{1}{8}\, a\, c2^2\, C2 + \right. \\
& \left(\frac{3}{4} + \frac{i}{4}\right) a\, c1\, d1\, D2 - \left(\frac{1}{4} + \frac{i}{4}\right) a\, c2\, d1\, D2 - \left(\frac{1}{4} + \frac{i}{4}\right) a\, c1\, d2\, D2 + \left(\frac{1}{4} + \frac{3\, i}{4}\right) a\, c2\, d2\, D2 + \\
& \frac{1}{8}\, i\, a\, c1^2\, C1\, e^{-i t} + \frac{1}{4}\, a\, c1\, C1\, c2\, e^{-i t} - \frac{1}{8}\, i\, a\, C1\, c2^2\, e^{-i t} + \frac{1}{8}\, a\, c1^2\, C2\, e^{-i t} - \\
& \frac{1}{4}\, i\, a\, c1\, c2\, C2\, e^{-i t} - \frac{1}{8}\, a\, c2^2\, C2\, e^{-i t} - \left(\frac{1}{4} + \frac{i}{4}\right) a\, c1\, d1\, D2\, e^{-i t} - \left(\frac{1}{4} - \frac{i}{4}\right) a\, c2\, d1\, D2\, e^{-i t} - \\
& \left(\frac{1}{4} - \frac{i}{4}\right) a\, c1\, d2\, D2\, e^{-i t} + \left(\frac{1}{4} + \frac{i}{4}\right) a\, c2\, d2\, D2\, e^{-i t} - \frac{5}{8}\, i\, a\, c1^2\, C1\, e^{i t} + \frac{3}{4}\, a\, c1\, C1\, c2\, e^{i t} + \\
& \frac{1}{8}\, i\, a\, C1\, c2^2\, e^{i t} - \frac{1}{8}\, a\, c1^2\, C2\, e^{i t} - \frac{3}{4}\, i\, a\, c1\, c2\, C2\, e^{i t} + \frac{5}{8}\, a\, c2^2\, C2\, e^{i t} + \\
& \left(\frac{1}{4} + \frac{5\, i}{4}\right) a\, c1\, d1\, D2\, e^{i t} - \left(\frac{3}{4} - \frac{3\, i}{4}\right) a\, c2\, d1\, D2\, e^{i t} - \left(\frac{3}{4} - \frac{3\, i}{4}\right) a\, c1\, d2\, D2\, e^{i t} - \\
& \left(\frac{5}{4} + \frac{i}{4}\right) a\, c2\, d2\, D2\, e^{i t} - \frac{3}{8}\, i\, a\, c1^2\, C1\, e^{2 i t} + \frac{3}{4}\, a\, c1\, C1\, c2\, e^{2 i t} + \frac{3}{8}\, i\, a\, C1\, c2^2\, e^{2 i t} + \\
& \frac{3}{8}\, a\, c1^2\, C2\, e^{2 i t} + \frac{3}{4}\, i\, a\, c1\, c2\, C2\, e^{2 i t} - \frac{3}{8}\, a\, c2^2\, C2\, e^{2 i t} - \left(\frac{3}{4} - \frac{3\, i}{4}\right) a\, c1\, d1\, D2\, e^{2 i t} - \\
& \left(\frac{3}{4} + \frac{3\, i}{4}\right) a\, c2\, d1\, D2\, e^{2 i t} - \left(\frac{3}{4} + \frac{3\, i}{4}\right) a\, c1\, d2\, D2\, e^{2 i t} + \left(\frac{3}{4} - \frac{3\, i}{4}\right) a\, c2\, d2\, D2\, e^{2 i t} - \\
& \frac{1}{8}\, i\, C1\, d1^2\, G - \frac{3}{8}\, C2\, d1^2\, G + \frac{1}{4}\, C1\, d1\, d2\, G + \frac{1}{4}\, i\, C2\, d1\, d2\, G - \frac{3}{8}\, i\, C1\, d2^2\, G - \frac{1}{8}\, C2\, d2^2\, G + \\
& \frac{1}{8}\, i\, C1\, d1^2\, e^{-i t}\, G + \frac{1}{8}\, C2\, d1^2\, e^{-i t}\, G + \frac{1}{4}\, C1\, d1\, d2\, e^{-i t}\, G - \frac{1}{4}\, i\, C2\, d1\, d2\, e^{-i t}\, G - \\
& \frac{1}{8}\, i\, C1\, d2^2\, e^{-i t}\, G - \frac{1}{8}\, C2\, d2^2\, e^{-i t}\, G - \frac{5}{8}\, i\, C1\, d1^2\, e^{i t}\, G - \frac{1}{8}\, C2\, d1^2\, e^{i t}\, G + \frac{3}{4}\, C1\, d1\, d2\, e^{i t}\, G - \\
& \frac{3}{4}\, i\, C2\, d1\, d2\, e^{i t}\, G + \frac{1}{8}\, i\, C1\, d2^2\, e^{i t}\, G + \frac{5}{8}\, C2\, d2^2\, e^{i t}\, G - \frac{3}{8}\, i\, C1\, d1^2\, e^{2 i t}\, G + \frac{3}{8}\, C2\, d1^2\, e^{2 i t}\, G + \\
& \left. \frac{3}{4}\, C1\, d1\, d2\, e^{2 i t}\, G + \frac{3}{4}\, i\, C2\, d1\, d2\, e^{2 i t}\, G + \frac{3}{8}\, i\, C1\, d2^2\, e^{2 i t}\, G - \frac{3}{8}\, C2\, d2^2\, e^{2 i t}\, G - \frac{p23}{2} + \frac{i\, z23}{2}\right)
\end{aligned}
$$

In[•]:=
```
dp2trunc := (1/2 c1 e^(i t) + 1/2 i c2 e^(i t)) s +
  s^3 (-1/8 a c1^2 C1 - 1/4 i a c1 C1 c2 - 3/8 a C1 c2^2 + 3/8 i a c1^2 C2 + 1/4 a c1 c2 C2 + 1/8 i a c2^2 C2 +
    3/4 a c1 d1 D1 - 1/4 i a c2 d1 D1 - 1/4 i a c1 D1 d2 + 1/4 a c2 D1 d2 - (1/2 + (3 i)/4) a c1 d1 D2 -
    (1/4 - i/2) a c2 d1 D2 - (1/4 - i/2) a c1 d2 D2 + (1/2 - i/4) a c2 d2 D2 + 3/8 a c1^2 C1 e^(-i t) -
    3/4 i a c1 C1 c2 e^(-i t) - 3/8 a C1 c2^2 e^(-i t) - 3/8 i a c1^2 C2 e^(-i t) - 3/4 a c1 c2 C2 e^(-i t) +
    3/8 i a c2^2 C2 e^(-i t) - 1/4 a c1 d1 D1 e^(-i t) + 1/4 i a c2 d1 D1 e^(-i t) + 1/4 i a c1 D1 d2 e^(-i t) +
    1/4 a c2 D1 d2 e^(-i t) - (1/2 - (3 i)/4) a c1 d1 D2 e^(-i t) + (3/4 + i/2) a c2 d1 D2 e^(-i t) +
    (3/4 + i/2) a c1 d2 D2 e^(-i t) + (1/2 - (3 i)/4) a c2 d2 D2 e^(-i t) - 3/8 a c1^2 C1 e^(i t) - 5/4 i a c1 C1 c2 e^(i t) +
    7/8 a C1 c2^2 e^(i t) + 7/8 i a c1^2 C2 e^(i t) - 5/4 a c1 c2 C2 e^(i t) - 3/8 i a c2^2 C2 e^(i t) +
    1/4 a c1 d1 D1 e^(i t) + 3/4 i a c2 d1 D1 e^(i t) + 3/4 i a c1 D1 d2 e^(i t) - 5/4 a c2 D1 d2 e^(i t) +
    (1/2 - (7 i)/4) a c1 d1 D2 e^(i t) + (5/4 + i/2) a c2 d1 D2 e^(i t) + (5/4 + i/2) a c1 d2 D2 e^(i t) -
    (1/2 - (3 i)/4) a c2 d2 D2 e^(i t) + 1/8 a c1^2 C1 e^(2 i t) + 1/4 i a c1 C1 c2 e^(2 i t) - 1/8 a C1 c2^2 e^(2 i t) +
    1/8 i a c1^2 C2 e^(2 i t) - 1/4 a c1 c2 C2 e^(2 i t) - 1/8 i a c2^2 C2 e^(2 i t) - 3/4 a c1 d1 D1 e^(2 i t) -
    3/4 i a c2 d1 D1 e^(2 i t) - 3/4 i a c1 D1 d2 e^(2 i t) + 3/4 a c2 D1 d2 e^(2 i t) + (1/2 - i/4) a c1 d1 D2 e^(2 i t) +
    (1/4 + i/2) a c2 d1 D2 e^(2 i t) + (1/4 + i/2) a c1 d2 D2 e^(2 i t) - (1/2 - i/4) a c2 d2 D2 e^(2 i t) -
    1/8 C1 d1^2 G + 3/8 i C2 d1^2 G - 1/4 i C1 d1 d2 G + 1/4 C2 d1 d2 G - 3/8 C1 d2^2 G + 1/8 i C2 d2^2 G +
    3/8 C1 d1^2 e^(-i t) G - 3/8 i C2 d1^2 e^(-i t) G - 3/4 i C1 d1 d2 e^(-i t) G - 3/4 C2 d1 d2 e^(-i t) G -
    3/8 C1 d2^2 e^(-i t) G + 3/8 i C2 d2^2 e^(-i t) G - 3/8 C1 d1^2 e^(i t) G + 7/8 i C2 d1^2 e^(i t) G - 5/4 i C1 d1 d2 e^(i t) G -
    5/4 C2 d1 d2 e^(i t) G + 7/8 C1 d2^2 e^(i t) G - 3/8 i C2 d2^2 e^(i t) G + 1/8 C1 d1^2 e^(2 i t) G + 1/8 i C2 d1^2 e^(2 i t) G +
    1/4 i C1 d1 d2 e^(2 i t) G - 1/4 C2 d1 d2 e^(2 i t) G - 1/8 C1 d2^2 e^(2 i t) G - 1/8 i C2 d2^2 e^(2 i t) G + (i p23)/2 + z23/2)
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In[•]:=
```
DSolve[
  {l'[t] == -1/8 i a c1^2 C1 + 1/4 a c1 C1 c2 - 3/8 i a C1 c2^2 - 3/8 a c1^2 C2 + 1/4 i a c1 c2 C2 - 1/8 a c2^2 C2 +
    (3/4 + i/4) a c1 d1 D2 - (1/4 + i/4) a c2 d1 D2 - (1/4 + i/4) a c1 d2 D2 + (1/4 + (3 i)/4) a c2 d2 D2 +
```

$$\frac{1}{8} i\, a\, c1^2\, C1\, e^{-i t} + \frac{1}{4} a\, c1\, C1\, c2\, e^{-i t} - \frac{1}{8} i\, a\, C1\, c2^2\, e^{-i t} + \frac{1}{8} a\, c1^2\, C2\, e^{-i t} -$$
$$\frac{1}{4} i\, a\, c1\, c2\, C2\, e^{-i t} - \frac{1}{8} a\, c2^2\, C2\, e^{-i t} - \left(\frac{1}{4} + \frac{i}{4}\right) a\, c1\, d1\, D2\, e^{-i t} - \left(\frac{1}{4} - \frac{i}{4}\right) a\, c2\, d1\, D2\, e^{-i t} -$$
$$\left(\frac{1}{4} - \frac{i}{4}\right) a\, c1\, d2\, D2\, e^{-i t} + \left(\frac{1}{4} + \frac{i}{4}\right) a\, c2\, d2\, D2\, e^{-i t} - \frac{5}{8} i\, a\, c1^2\, C1\, e^{i t} + \frac{3}{4} a\, c1\, C1\, c2\, e^{i t} +$$
$$\frac{1}{8} i\, a\, C1\, c2^2\, e^{i t} - \frac{1}{8} a\, c1^2\, C2\, e^{i t} - \frac{3}{4} i\, a\, c1\, c2\, C2\, e^{i t} + \frac{5}{8} a\, c2^2\, C2\, e^{i t} +$$
$$\left(\frac{1}{4} + \frac{5 i}{4}\right) a\, c1\, d1\, D2\, e^{i t} - \left(\frac{3}{4} - \frac{3 i}{4}\right) a\, c2\, d1\, D2\, e^{i t} - \left(\frac{3}{4} - \frac{3 i}{4}\right) a\, c1\, d2\, D2\, e^{i t} -$$
$$\left(\frac{5}{4} + \frac{i}{4}\right) a\, c2\, d2\, D2\, e^{i t} - \frac{3}{8} i\, a\, c1^2\, C1\, e^{2 i t} + \frac{3}{4} a\, c1\, C1\, c2\, e^{2 i t} + \frac{3}{8} i\, a\, C1\, c2^2\, e^{2 i t} +$$
$$\frac{3}{8} a\, c1^2\, C2\, e^{2 i t} + \frac{3}{4} i\, a\, c1\, c2\, C2\, e^{2 i t} - \frac{3}{8} a\, c2^2\, C2\, e^{2 i t} - \left(\frac{3}{4} - \frac{3 i}{4}\right) a\, c1\, d1\, D2\, e^{2 i t} -$$
$$\left(\frac{3}{4} + \frac{3 i}{4}\right) a\, c2\, d1\, D2\, e^{2 i t} - \left(\frac{3}{4} + \frac{3 i}{4}\right) a\, c1\, d2\, D2\, e^{2 i t} + \left(\frac{3}{4} - \frac{3 i}{4}\right) a\, c2\, d2\, D2\, e^{2 i t} -$$
$$\frac{1}{8} i\, C1\, d1^2\, G - \frac{3}{8} C2\, d1^2\, G + \frac{1}{4} C1\, d1\, d2\, G + \frac{1}{4} i\, C2\, d1\, d2\, G - \frac{3}{8} i\, C1\, d2^2\, G -$$
$$\frac{1}{8} C2\, d2^2\, G + \frac{1}{8} i\, C1\, d1^2\, e^{-i t}\, G + \frac{1}{8} C2\, d1^2\, e^{-i t}\, G + \frac{1}{4} C1\, d1\, d2\, e^{-i t}\, G -$$
$$\frac{1}{4} i\, C2\, d1\, d2\, e^{-i t}\, G - \frac{1}{8} i\, C1\, d2^2\, e^{-i t}\, G - \frac{1}{8} C2\, d2^2\, e^{-i t}\, G - \frac{5}{8} i\, C1\, d1^2\, e^{i t}\, G -$$
$$\frac{1}{8} C2\, d1^2\, e^{i t}\, G + \frac{3}{4} C1\, d1\, d2\, e^{i t}\, G - \frac{3}{4} i\, C2\, d1\, d2\, e^{i t}\, G + \frac{1}{8} i\, C1\, d2^2\, e^{i t}\, G +$$
$$\frac{5}{8} C2\, d2^2\, e^{i t}\, G - \frac{3}{8} i\, C1\, d1^2\, e^{2 i t}\, G + \frac{3}{8} C2\, d1^2\, e^{2 i t}\, G + \frac{3}{4} C1\, d1\, d2\, e^{2 i t}\, G +$$
$$\frac{3}{4} i\, C2\, d1\, d2\, e^{2 i t}\, G + \frac{3}{8} i\, C1\, d2^2\, e^{2 i t}\, G - \frac{3}{8} C2\, d2^2\, e^{2 i t}\, G - \frac{m[t]}{2} + \frac{i * l[t]}{2},$$

$$m'[t] == -\frac{1}{8} a\, c1^2\, C1 - \frac{1}{4} i\, a\, c1\, C1\, c2 - \frac{3}{8} a\, C1\, c2^2 + \frac{3}{8} i\, a\, c1^2\, C2 + \frac{1}{4} a\, c1\, c2\, C2 +$$
$$\frac{1}{8} i\, a\, c2^2\, C2 + \frac{3}{4} a\, c1\, d1\, D1 - \frac{1}{4} i\, a\, c2\, d1\, D1 - \frac{1}{4} i\, a\, c1\, D1\, d2 + \frac{1}{4} a\, c2\, D1\, d2 -$$
$$\left(\frac{1}{2} + \frac{3 i}{4}\right) a\, c1\, d1\, D2 - \left(\frac{1}{4} - \frac{i}{2}\right) a\, c2\, d1\, D2 - \left(\frac{1}{4} - \frac{i}{2}\right) a\, c1\, d2\, D2 + \left(\frac{1}{2} - \frac{i}{4}\right) a\, c2\, d2\, D2 +$$
$$\frac{3}{8} a\, c1^2\, C1\, e^{-i t} - \frac{3}{4} i\, a\, c1\, C1\, c2\, e^{-i t} - \frac{3}{8} a\, C1\, c2^2\, e^{-i t} - \frac{3}{8} i\, a\, c1^2\, C2\, e^{-i t} -$$
$$\frac{3}{4} a\, c1\, c2\, C2\, e^{-i t} + \frac{3}{8} i\, a\, c2^2\, C2\, e^{-i t} - \frac{1}{4} a\, c1\, d1\, D1\, e^{-i t} + \frac{1}{4} i\, a\, c2\, d1\, D1\, e^{-i t} +$$
$$\frac{1}{4} i\, a\, c1\, D1\, d2\, e^{-i t} + \frac{1}{4} a\, c2\, D1\, d2\, e^{-i t} - \left(\frac{1}{2} - \frac{3 i}{4}\right) a\, c1\, d1\, D2\, e^{-i t} + \left(\frac{3}{4} + \frac{i}{2}\right) a\, c2\, d1\, D2\, e^{-i t} +$$
$$\left(\frac{3}{4} + \frac{i}{2}\right) a\, c1\, d2\, D2\, e^{-i t} + \left(\frac{1}{2} - \frac{3 i}{4}\right) a\, c2\, d2\, D2\, e^{-i t} - \frac{3}{8} a\, c1^2\, C1\, e^{i t} - \frac{5}{4} i\, a\, c1\, C1\, c2\, e^{i t} +$$
$$\frac{7}{8} a\, C1\, c2^2\, e^{i t} + \frac{7}{8} i\, a\, c1^2\, C2\, e^{i t} - \frac{5}{4} a\, c1\, c2\, C2\, e^{i t} - \frac{3}{8} i\, a\, c2^2\, C2\, e^{i t} + \frac{1}{4} a\, c1\, d1\, D1\, e^{i t} +$$
$$\frac{3}{4} i\, a\, c2\, d1\, D1\, e^{i t} + \frac{3}{4} i\, a\, c1\, D1\, d2\, e^{i t} - \frac{5}{4} a\, c2\, D1\, d2\, e^{i t} + \left(\frac{1}{2} - \frac{7 i}{4}\right) a\, c1\, d1\, D2\, e^{i t} +$$

$$\left(\frac{5}{4}+\frac{i}{2}\right) a\, c2\, d1\, D2\, e^{i t}+\left(\frac{5}{4}+\frac{i}{2}\right) a\, c1\, d2\, D2\, e^{i t}-\left(\frac{1}{2}-\frac{3 i}{4}\right) a\, c2\, d2\, D2\, e^{i t}+$$
$$\frac{1}{8} a\, c1^2\, C1\, e^{2 i t}+\frac{1}{4} i\, a\, c1\, C1\, c2\, e^{2 i t}-\frac{1}{8} a\, C1\, c2^2\, e^{2 i t}+\frac{1}{8} i\, a\, c1^2\, C2\, e^{2 i t}-$$
$$\frac{1}{4} a\, c1\, c2\, C2\, e^{2 i t}-\frac{1}{8} i\, a\, c2^2\, C2\, e^{2 i t}-\frac{3}{4} a\, c1\, d1\, D1\, e^{2 i t}-\frac{3}{4} i\, a\, c2\, d1\, D1\, e^{2 i t}-$$
$$\frac{3}{4} i\, a\, c1\, D1\, d2\, e^{2 i t}+\frac{3}{4} a\, c2\, D1\, d2\, e^{2 i t}+\left(\frac{1}{2}-\frac{i}{4}\right) a\, c1\, d1\, D2\, e^{2 i t}+\left(\frac{1}{4}+\frac{i}{2}\right) a\, c2\, d1\, D2\, e^{2 i t}+$$
$$\left(\frac{1}{4}+\frac{i}{2}\right) a\, c1\, d2\, D2\, e^{2 i t}-\left(\frac{1}{2}-\frac{i}{4}\right) a\, c2\, d2\, D2\, e^{2 i t}-\frac{1}{8} C1\, d1^2\, G+\frac{3}{8} i\, C2\, d1^2\, G-$$
$$\frac{1}{4} i\, C1\, d1\, d2\, G+\frac{1}{4} C2\, d1\, d2\, G-\frac{3}{8} C1\, d2^2\, G+\frac{1}{8} i\, C2\, d2^2\, G+\frac{3}{8} C1\, d1^2\, e^{-i t}\, G-\frac{3}{8} i\, C2\, d1^2\, e^{-i t}\, G-$$
$$\frac{3}{4} i\, C1\, d1\, d2\, e^{-i t}\, G-\frac{3}{4} C2\, d1\, d2\, e^{-i t}\, G-\frac{3}{8} C1\, d2^2\, e^{-i t}\, G+\frac{3}{8} i\, C2\, d2^2\, e^{-i t}\, G-\frac{3}{8} C1\, d1^2\, e^{i t}\, G+$$
$$\frac{7}{8} i\, C2\, d1^2\, e^{i t}\, G-\frac{5}{4} i\, C1\, d1\, d2\, e^{i t}\, G-\frac{5}{4} C2\, d1\, d2\, e^{i t}\, G+\frac{7}{8} C1\, d2^2\, e^{i t}\, G-\frac{3}{8} i\, C2\, d2^2\, e^{i t}\, G+$$
$$\frac{1}{8} C1\, d1^2\, e^{2 i t}\, G+\frac{1}{8} i\, C2\, d1^2\, e^{2 i t}\, G+\frac{1}{4} i\, C1\, d1\, d2\, e^{2 i t}\, G-\frac{1}{4} C2\, d1\, d2\, e^{2 i t}\, G-$$
$$\frac{1}{8} C1\, d2^2\, e^{2 i t}\, G-\frac{1}{8} i\, C2\, d2^2\, e^{2 i t}\, G+\frac{i * m[t]}{2}+\frac{l[t]}{2}\Big\},\ \{l[t], m[t]\}, t\Big]$$

Out[•]=

$$\Big\{\Big\{l[t] \to$$
$$\frac{1}{16} e^{-\frac{3 i t}{2}} \Big(-a \Big(c1 \Big(-d1\, D1+i\, D1\, d2-\left(3-4 i\right) d1\, D2+\left(4+3 i\right) d2\, D2+8\, d1\, D1\, e^{i t}-4 i\, D1\, d2\, e^{i t}-16 i\, d1\, D2\, e^{i t}-\left(8-4 i\right) d2\, D2\, e^{i t}+8\, d1\, D1\, e^{3 i t}+12 i\, D1\, d2\, e^{3 i t}-\left(16+16 i\right) d1\, D2\, e^{3 i t}+\left(8-12 i\right) d2\, D2\, e^{3 i t}-3\, d1\, D1\, e^{4 i t}-3 i\, D1\, d2\, e^{4 i t}-\left(1+4 i\right) d1\, D2\, e^{4 i t}+\left(4-i\right) d2\, D2\, e^{4 i t}+4 i\, d1\, D1\, e^{2 i t} t+8\, D1\, d2\, e^{2 i t} t-\left(16+20 i\right) d1\, D2\, e^{2 i t} t+\left(8-16 i\right) d2\, D2\, e^{2 i t} t-4\, c2\, C2\, \left(1-2\, e^{i t}+2\, e^{3 i t}+e^{4 i t}-4 i\, e^{2 i t} t\right)\Big)+4 i\, C1\, c2\, \left(-1+e^{4 i t}+4 i\, e^{2 i t} t\right)\Big)+$$
$$c2 \Big(i\, d1\, D1+D1\, d2+\left(4+3 i\right) d1\, D2+\left(3-4 i\right) d2\, D2-4 i\, d1\, D1\, e^{i t}-\left(8-4 i\right) d1\, D2\, e^{i t}+8\, d2\, D2\, e^{i t}+12 i\, d1\, D1\, e^{3 i t}-16\, D1\, d2\, e^{3 i t}+\left(8-12 i\right) d1\, D2\, e^{3 i t}+8\, d2\, D2\, e^{3 i t}-3 i\, d1\, D1\, e^{4 i t}+3\, D1\, d2\, e^{4 i t}+\left(4-i\right) d1\, D2\, e^{4 i t}+\left(1+4 i\right) d2\, D2\, e^{4 i t}+8\, d1\, D1\, e^{2 i t} t+12 i\, D1\, d2\, e^{2 i t} t+\left(8-16 i\right) d1\, D2\, e^{2 i t} t+\left(16+4 i\right) d2\, D2\, e^{2 i t} t-2 i\, c2\, C2\, \left(-1+e^{4 i t}-4 i\, e^{2 i t} t\right)-2\, C1\, c2\, \left(1+2\, e^{i t}-2\, e^{3 i t}+e^{4 i t}+4 i\, e^{2 i t} t\right)\Big)+$$
$$2\, c1^2 \Big(C1 \left(1-2\, e^{i t}+2\, e^{3 i t}+e^{4 i t}+4 i\, e^{2 i t} t\right)+C2 \left(-i+4 i\, e^{i t}+4 i\, e^{3 i t}+i\, e^{4 i t}+4\, e^{2 i t} t\right)\Big)-$$
$$2\, G \Big(C1 \Big(2 i\, d1\, d2 \left(-1+e^{4 i t}+4 i\, e^{2 i t} t\right)-d2^2 \left(1+2\, e^{i t}-2\, e^{3 i t}+e^{4 i t}+4 i\, e^{2 i t} t\right)+d1^2 \left(1-2\, e^{i t}+2\, e^{3 i t}+e^{4 i t}+4 i\, e^{2 i t} t\right)\Big)+C2 \Big(-i\, d2^2 \left(-1+e^{4 i t}-4 i\, e^{2 i t} t\right)-2\, d1\, d2 \left(1-2\, e^{i t}+2\, e^{3 i t}+e^{4 i t}-4 i\, e^{2 i t} t\right)+d1^2 \left(-i+4 i\, e^{i t}+4 i\, e^{3 i t}+i\, e^{4 i t}+4\, e^{2 i t} t\right)\Big)\Big)\Big) \text{Cos}\left[\frac{t}{2}\right]+e^{\frac{i t}{2}} C[1] \text{Cos}\left[\frac{t}{2}\right]-$$
$$\frac{1}{4} e^{\frac{i t}{2}} \Big(\frac{1}{4} e^{-2 i t} \Big(a \left(i\, c1+c2\right) \left(-2 i\, C1\, c2+2\, c1 \left(C1-i\, C2\right)-2\, c2\, C2-d1\, D1+i\, D1\, d2-\left(3-4 i\right) d1\, D2+\left(4+3 i\right) d2\, D2\right)+2 \left(i\, C1+C2\right) \left(d1-i\, d2\right)^2 G\Big)+$$
$$\frac{1}{4} e^{2 i t} \Big(a \left(c1+i\, c2\right) \left(2\, C1\, c2+2\, c1 \left(-i\, C1+C2\right)+i \left(2\, c2\, C2+3\, d1\, D1+\right.\right.$$

$$
\begin{aligned}
&\qquad 3\,i\,D1\,d2 + \left(1+4\,i\right)\,d1\,D2 - \left(4-i\right)\,d2\,D2\right) + 2\,\left(-i\,C1+C2\right)\,\left(d1+i\,d2\right)^2\,G\Big) + \\
&e^{i\,t}\,\left(a\,\left(c1^2\,C2 + c2\,\left(-2\,i\,C1\,c2 + c2\,C2 + i\,D1\,d2 + 2\,d1\,D2 - \left(2-3\,i\right)\,d2\,D2\right) + \right.\right. \\
&\qquad c1\,\left(-2\,C1\,c2 + i\,d1\,\left(D1 - \left(1-2\,i\right)\,D2\right) + 2\,d2\,D2\right)\Big) + \\
&\quad \left(d1+i\,d2\right)\,\left(C2\,\left(d1-i\,d2\right) - 2\,C1\,d2\right)\,G\Big) + \\
&e^{-i\,t}\,\left(-a\,\left(c1^2\,C2 + c2\,\left(2\,i\,C1\,c2 + c2\,C2 - i\,D1\,d2 + 2\,d1\,D2 - \left(2+3\,i\right)\,d2\,D2\right) + \right.\right. \\
&\qquad c1\,\left(-2\,C1\,c2 - i\,d1\,D1 - \left(2-i\right)\,d1\,D2 + 2\,d2\,D2\right)\Big) - \\
&\quad \left(d1-i\,d2\right)\,\left(C2\,\left(d1+i\,d2\right) - 2\,C1\,d2\right)\,G\Big) + \Big(a\,\left(-2\,c1^2\,\left(C1-i\,C2\right) + \\
&\qquad c2\,\left(2\,C1\,c2 - 2\,i\,c2\,C2 + i\,d1\,D1 - 2\,D1\,d2 + \left(4+3\,i\right)\,d1\,D2 - \left(2-4\,i\right)\,d2\,D2\right) + \\
&\qquad c1\,\left(-4\,i\,C1\,c2 - 4\,c2\,C2 + 2\,d1\,D1 + i\,D1\,d2 + \left(2-4\,i\right)\,d1\,D2 + \left(4+3\,i\right)\,d2\,D2\right)\Big) - \\
&\quad 2\,\left(C1-i\,C2\right)\,\left(d1+i\,d2\right)^2\,G\Big)\,t\Big)\,\text{Sin}\left[\frac{t}{2}\right] - e^{\frac{i\,t}{2}}\,C[2]\,\text{Sin}\left[\frac{t}{2}\right], \\
m[t] \to\ &\frac{1}{4}\,e^{\frac{i\,t}{2}}\,\left(\frac{1}{4}\,e^{-2\,i\,t}\,\left(a\,\left(i\,c1+c2\right)\,\left(-2\,i\,C1\,c2 + 2\,c1\,\left(C1-i\,C2\right) - 2\,c2\,C2 - d1\,D1 + \right.\right.\right. \\
&\qquad i\,D1\,d2 - \left(3-4\,i\right)\,d1\,D2 + \left(4+3\,i\right)\,d2\,D2\right) + 2\,\left(i\,C1+C2\right)\,\left(d1-i\,d2\right)^2\,G\Big) + \\
&\frac{1}{4}\,e^{2\,i\,t}\,\left(a\,\left(c1+i\,c2\right)\,\left(2\,C1\,c2 + 2\,c1\,\left(-i\,C1+C2\right) + i\,\left(2\,c2\,C2 + 3\,d1\,D1 + \right.\right.\right. \\
&\qquad 3\,i\,D1\,d2 + \left(1+4\,i\right)\,d1\,D2 - \left(4-i\right)\,d2\,D2\right) + 2\,\left(-i\,C1+C2\right)\,\left(d1+i\,d2\right)^2\,G\Big) + \\
&e^{i\,t}\,\left(a\,\left(c1^2\,C2 + c2\,\left(-2\,i\,C1\,c2 + c2\,C2 + i\,D1\,d2 + 2\,d1\,D2 - \left(2-3\,i\right)\,d2\,D2\right) + \right.\right. \\
&\qquad c1\,\left(-2\,C1\,c2 + i\,d1\,\left(D1 - \left(1-2\,i\right)\,D2\right) + 2\,d2\,D2\right)\Big) + \\
&\quad \left(d1+i\,d2\right)\,\left(C2\,\left(d1-i\,d2\right) - 2\,C1\,d2\right)\,G\Big) + \\
&e^{-i\,t}\,\left(-a\,\left(c1^2\,C2 + c2\,\left(2\,i\,C1\,c2 + c2\,C2 - i\,D1\,d2 + 2\,d1\,D2 - \left(2+3\,i\right)\,d2\,D2\right) + \right.\right. \\
&\qquad c1\,\left(-2\,C1\,c2 - i\,d1\,D1 - \left(2-i\right)\,d1\,D2 + 2\,d2\,D2\right)\Big) - \\
&\quad \left(d1-i\,d2\right)\,\left(C2\,\left(d1+i\,d2\right) - 2\,C1\,d2\right)\,G\Big) + \Big(a\,\left(-2\,c1^2\,\left(C1-i\,C2\right) + \\
&\qquad c2\,\left(2\,C1\,c2 - 2\,i\,c2\,C2 + i\,d1\,D1 - 2\,D1\,d2 + \left(4+3\,i\right)\,d1\,D2 - \left(2-4\,i\right)\,d2\,D2\right) + \\
&\qquad c1\,\left(-4\,i\,C1\,c2 - 4\,c2\,C2 + 2\,d1\,D1 + i\,D1\,d2 + \left(2-4\,i\right)\,d1\,D2 + \left(4+3\,i\right)\,d2\,D2\right)\Big) - \\
&\quad 2\,\left(C1-i\,C2\right)\,\left(d1+i\,d2\right)^2\,G\Big)\,t\Big)\,\text{Cos}\left[\frac{t}{2}\right] + e^{\frac{i\,t}{2}}\,C[2]\,\text{Cos}\left[\frac{t}{2}\right] + \\
&\frac{1}{16}\,e^{-\frac{3\,i\,t}{2}}\,\left(-a\,\left(c1\,\left(-d1\,D1 + i\,D1\,d2 - \left(3-4\,i\right)\,d1\,D2 + \left(4+3\,i\right)\,d2\,D2 + 8\,d1\,D1\,e^{i\,t} - \right.\right.\right. \\
&\qquad 4\,i\,D1\,d2\,e^{i\,t} - 16\,i\,d1\,D2\,e^{i\,t} - \left(8-4\,i\right)\,d2\,D2\,e^{i\,t} + 8\,d1\,D1\,e^{3\,i\,t} + \\
&\qquad 12\,i\,D1\,d2\,e^{3\,i\,t} - \left(16+16\,i\right)\,d1\,D2\,e^{3\,i\,t} + \left(8-12\,i\right)\,d2\,D2\,e^{3\,i\,t} - 3\,d1\,D1\,e^{4\,i\,t} - \\
&\qquad 3\,i\,D1\,d2\,e^{4\,i\,t} - \left(1+4\,i\right)\,d1\,D2\,e^{4\,i\,t} + \left(4-i\right)\,d2\,D2\,e^{4\,i\,t} + 4\,i\,d1\,D1\,e^{2\,i\,t}\,t + \\
&\qquad 8\,D1\,d2\,e^{2\,i\,t}\,t - \left(16+20\,i\right)\,d1\,D2\,e^{2\,i\,t}\,t + \left(8-16\,i\right)\,d2\,D2\,e^{2\,i\,t}\,t - 4\,c2\,C2 \\
&\qquad \left.\left(1 - 2\,e^{i\,t} + 2\,e^{3\,i\,t} + e^{4\,i\,t} - 4\,i\,e^{2\,i\,t}\,t\right) + 4\,i\,C1\,c2\,\left(-1 + e^{4\,i\,t} + 4\,i\,e^{2\,i\,t}\,t\right)\right) + \\
&\quad c2\,\left(i\,d1\,D1 + D1\,d2 + \left(4+3\,i\right)\,d1\,D2 + \left(3-4\,i\right)\,d2\,D2 - 4\,i\,d1\,D1\,e^{i\,t} - \right. \\
&\qquad \left(8-4\,i\right)\,d1\,D2\,e^{i\,t} + 8\,d2\,D2\,e^{i\,t} + 12\,i\,d1\,D1\,e^{3\,i\,t} - 16\,D1\,d2\,e^{3\,i\,t} + \\
&\qquad \left(8-12\,i\right)\,d1\,D2\,e^{3\,i\,t} + 8\,d2\,D2\,e^{3\,i\,t} - 3\,i\,d1\,D1\,e^{4\,i\,t} + 3\,D1\,d2\,e^{4\,i\,t} + \\
&\qquad \left(4-i\right)\,d1\,D2\,e^{4\,i\,t} + \left(1+4\,i\right)\,d2\,D2\,e^{4\,i\,t} + 8\,d1\,D1\,e^{2\,i\,t}\,t + 12\,i\,D1\,d2\,e^{2\,i\,t}\,t + \\
&\qquad \left(8-16\,i\right)\,d1\,D2\,e^{2\,i\,t}\,t + \left(16+4\,i\right)\,d2\,D2\,e^{2\,i\,t}\,t - 2\,i\,c2\,C2 \\
&\qquad \left.\left(-1 + e^{4\,i\,t} - 4\,i\,e^{2\,i\,t}\,t\right) - 2\,C1\,c2\,\left(1 + 2\,e^{i\,t} - 2\,e^{3\,i\,t} + e^{4\,i\,t} + 4\,i\,e^{2\,i\,t}\,t\right)\right) + \\
&\quad 2\,c1^2\,\left(C1\,\left(1 - 2\,e^{i\,t} + 2\,e^{3\,i\,t} + e^{4\,i\,t} + 4\,i\,e^{2\,i\,t}\,t\right) + \right. \\
&\qquad C2\,\left.\left.\left(-i + 4\,i\,e^{i\,t} + 4\,i\,e^{3\,i\,t} + i\,e^{4\,i\,t} + 4\,e^{2\,i\,t}\,t\right)\right)\right) - \\
&2\,G\,\left(C1\,\left(2\,i\,d1\,d2\,\left(-1 + e^{4\,i\,t} + 4\,i\,e^{2\,i\,t}\,t\right) - d2^2\,\left(1 + 2\,e^{i\,t} - 2\,e^{3\,i\,t} + e^{4\,i\,t} + 4\,i\,e^{2\,i\,t}\,t\right) + \right.\right.
\end{aligned}
$$

$$d1^2\left(1-2e^{it}+2e^{3it}+e^{4it}+4ie^{2it}t\right)\Big)+$$
$$C2\left(-id2^2\left(-1+e^{4it}-4ie^{2it}t\right)-2\,d1\,d2\left(1-2e^{it}+2e^{3it}+e^{4it}-4ie^{2it}t\right)+\right.$$
$$\left.d1^2\left(-i+4ie^{it}+4ie^{3it}+ie^{4it}+4e^{2it}t\right)\right)\Big)\Big)\,\text{Sin}\left[\frac{t}{2}\right]+e^{\frac{it}{2}}\,C[1]\,\text{Sin}\left[\frac{t}{2}\right]\Big\}\Big\}$$

In[•]:=
$$\frac{1}{16}e^{-\frac{3it}{2}}$$
$$\Big(-a\Big(c1\Big(-d1\,D1+i\,D1\,d2-(3-4i)\,d1\,D2+(4+3i)\,d2\,D2+8\,d1\,D1\,e^{it}-4i\,D1\,d2\,e^{it}-16$$
$$i\,d1\,D2\,e^{it}-(8-4i)\,d2\,D2\,e^{it}+8\,d1\,D1\,e^{3it}+12i\,D1\,d2\,e^{3it}-$$
$$(16+16i)\,d1\,D2\,e^{3it}+(8-12i)\,d2\,D2\,e^{3it}-3\,d1\,D1\,e^{4it}-3i\,D1\,d2\,e^{4it}-$$
$$(1+4i)\,d1\,D2\,e^{4it}+(4-i)\,d2\,D2\,e^{4it}+4i\,d1\,D1\,e^{2it}t+$$
$$8\,D1\,d2\,e^{2it}t-(16+20i)\,d1\,D2\,e^{2it}t+(8-16i)\,d2\,D2\,e^{2it}t-$$
$$4\,c2\,C2\left(1-2e^{it}+2e^{3it}+e^{4it}-4ie^{2it}t\right)+4i\,C1\,c2\left(-1+e^{4it}+4ie^{2it}t\right)\Big)+$$
$$c2\Big(i\,d1\,D1+D1\,d2+(4+3i)\,d1\,D2+(3-4i)\,d2\,D2-4i\,d1\,D1\,e^{it}-(8-4i)\,d1\,D2\,e^{it}+$$
$$8\,d2\,D2\,e^{it}+12i\,d1\,D1\,e^{3it}-16\,D1\,d2\,e^{3it}+(8-12i)\,d1\,D2\,e^{3it}+8\,d2\,D2\,e^{3it}-$$
$$3i\,d1\,D1\,e^{4it}+3\,D1\,d2\,e^{4it}+(4-i)\,d1\,D2\,e^{4it}+(1+4i)\,d2\,D2\,e^{4it}+$$
$$8\,d1\,D1\,e^{2it}t+12i\,D1\,d2\,e^{2it}t+(8-16i)\,d1\,D2\,e^{2it}t+(16+4i)\,d2\,D2\,e^{2it}t-$$
$$2i\,c2\,C2\left(-1+e^{4it}-4ie^{2it}t\right)-2\,C1\,c2\left(1+2e^{it}-2e^{3it}+e^{4it}+4ie^{2it}t\right)+$$
$$2\,c1^2\Big(C1\left(1-2e^{it}+2e^{3it}+e^{4it}+4ie^{2it}t\right)+$$
$$C2\left(-i+4ie^{it}+4ie^{3it}+ie^{4it}+4e^{2it}t\right)\Big)\Big)-$$
$$2\,G\Big(C1\Big(2i\,d1\,d2\left(-1+e^{4it}+4ie^{2it}t\right)-d2^2\left(1+2e^{it}-2e^{3it}+e^{4it}+4ie^{2it}t\right)+$$
$$d1^2\left(1-2e^{it}+2e^{3it}+e^{4it}+4ie^{2it}t\right)\Big)+$$
$$C2\left(-id2^2\left(-1+e^{4it}-4ie^{2it}t\right)-2\,d1\,d2\left(1-2e^{it}+2e^{3it}+e^{4it}-4ie^{2it}t\right)+\right.$$
$$\left.d1^2\left(-i+4ie^{it}+4ie^{3it}+ie^{4it}+4e^{2it}t\right)\right)\Big)\Big)\,\text{Cos}\left[\frac{t}{2}\right]+e^{\frac{it}{2}}\,C[1]\,\text{Cos}\left[\frac{t}{2}\right]-$$
$$\frac{1}{4}e^{\frac{it}{2}}\Big(\frac{1}{4}e^{-2it}\Big(a\left(i\,c1+c2\right)\left(-2i\,C1\,c2+2\,c1\left(C1-i\,C2\right)-2\,c2\,C2-d1\,D1+\right.$$
$$\left.i\,D1\,d2-(3-4i)\,d1\,D2+(4+3i)\,d2\,D2\right)+2\left(i\,C1+C2\right)\left(d1-i\,d2\right)^2G\Big)+$$
$$\frac{1}{4}e^{2it}\Big(a\left(c1+i\,c2\right)\left(2\,C1\,c2+2\,c1\left(-i\,C1+C2\right)+i\left(2\,c2\,C2+3\,d1\,D1+3i\,D1\,d2+\right.\right.$$
$$\left.\left.(1+4i)\,d1\,D2-(4-i)\,d2\,D2\right)\right)+2\left(-i\,C1+C2\right)\left(d1+i\,d2\right)^2G\Big)+$$
$$e^{it}\Big(a\left(c1^2\,C2+c2\left(-2i\,C1\,c2+c2\,C2+i\,D1\,d2+2\,d1\,D2-(2-3i)\,d2\,D2\right)+\right.$$
$$c1\left(-2\,C1\,c2+i\,d1\left(D1-(1-2i)\,D2\right)+2\,d2\,D2\right)\Big)+$$
$$\left(d1+i\,d2\right)\left(C2\left(d1-i\,d2\right)-2\,C1\,d2\right)G\Big)+$$
$$e^{-it}\Big(-a\left(c1^2\,C2+c2\left(2i\,C1\,c2+c2\,C2-i\,D1\,d2+2\,d1\,D2-(2+3i)\,d2\,D2\right)+\right.$$
$$c1\left(-2\,C1\,c2-i\,d1\,D1-(2-i)\,d1\,D2+2\,d2\,D2\right)\Big)-$$
$$\left(d1-i\,d2\right)\left(C2\left(d1+i\,d2\right)-2\,C1\,d2\right)G\Big)+\Big(a\left(-2\,c1^2\left(C1-i\,C2\right)+\right.$$
$$c2\left(2\,C1\,c2-2i\,c2\,C2+i\,d1\,D1-2\,D1\,d2+(4+3i)\,d1\,D2-(2-4i)\,d2\,D2\right)+$$
$$c1\left(-4i\,C1\,c2-4\,c2\,C2+2\,d1\,D1+i\,D1\,d2+(2-4i)\,d1\,D2+(4+3i)\,d2\,D2\right)-$$
$$\left.2\left(C1-i\,C2\right)\left(d1+i\,d2\right)^2G\Big)\,t\Big)\,\text{Sin}\left[\frac{t}{2}\right]-e^{\frac{it}{2}}\,C[2]\,\text{Sin}\left[\frac{t}{2}\right]$$

Out[•]=
$$\frac{1}{16} e^{-\frac{3 i t}{2}} \Big(-a \Big(c1 \Big(-d1\, D1 + i\, D1\, d2 - \big(3 - 4 i\big)\, d1\, D2 + \big(4 + 3 i\big)\, d2\, D2 + 8\, d1\, D1\, e^{i t} - 4 i\, D1\, d2\, e^{i t} - 16 \\ i\, d1\, D2\, e^{i t} - \big(8 - 4 i\big)\, d2\, D2\, e^{i t} + 8\, d1\, D1\, e^{3 i t} + 12 i\, D1\, d2\, e^{3 i t} - \\ \big(16 + 16 i\big)\, d1\, D2\, e^{3 i t} + \big(8 - 12 i\big)\, d2\, D2\, e^{3 i t} - 3\, d1\, D1\, e^{4 i t} - 3 i\, D1\, d2\, e^{4 i t} - \\ \big(1 + 4 i\big)\, d1\, D2\, e^{4 i t} + \big(4 - i\big)\, d2\, D2\, e^{4 i t} + 4 i\, d1\, D1\, e^{2 i t}\, t + \\ 8\, D1\, d2\, e^{2 i t}\, t - \big(16 + 20 i\big)\, d1\, D2\, e^{2 i t}\, t + \big(8 - 16 i\big)\, d2\, D2\, e^{2 i t}\, t - \\ 4\, c2\, C2 \big(1 - 2\, e^{i t} + 2\, e^{3 i t} + e^{4 i t} - 4 i\, e^{2 i t}\, t\big) + 4 i\, C1\, c2 \big(-1 + e^{4 i t} + 4 i\, e^{2 i t}\, t\big)\Big) + \\ c2 \Big(i\, d1\, D1 + D1\, d2 + \big(4 + 3 i\big)\, d1\, D2 + \big(3 - 4 i\big)\, d2\, D2 - 4 i\, d1\, D1\, e^{i t} - \big(8 - 4 i\big)\, d1\, D2\, e^{i t} + \\ 8\, d2\, D2\, e^{i t} + 12 i\, d1\, D1\, e^{3 i t} - 16\, D1\, d2\, e^{3 i t} + \big(8 - 12 i\big)\, d1\, D2\, e^{3 i t} + 8\, d2\, D2\, e^{3 i t} - \\ 3 i\, d1\, D1\, e^{4 i t} + 3\, D1\, d2\, e^{4 i t} + \big(4 - i\big)\, d1\, D2\, e^{4 i t} + \big(1 + 4 i\big)\, d2\, D2\, e^{4 i t} + \\ 8\, d1\, D1\, e^{2 i t}\, t + 12 i\, D1\, d2\, e^{2 i t}\, t + \big(8 - 16 i\big)\, d1\, D2\, e^{2 i t}\, t + \big(16 + 4 i\big)\, d2\, D2\, e^{2 i t}\, t - \\ 2 i\, c2\, C2 \big(-1 + e^{4 i t} - 4 i\, e^{2 i t}\, t\big) - 2\, C1\, c2 \big(1 + 2\, e^{i t} - 2\, e^{3 i t} + e^{4 i t} + 4 i\, e^{2 i t}\, t\big)\Big) + \\ 2\, c1^2 \Big(C1 \big(1 - 2\, e^{i t} + 2\, e^{3 i t} + e^{4 i t} + 4 i\, e^{2 i t}\, t\big) + \\ C2 \big(-i + 4 i\, e^{i t} + 4 i\, e^{3 i t} + i\, e^{4 i t} + 4\, e^{2 i t}\, t\big)\Big)\Big) - \\ 2\, G \Big(C1 \Big(2 i\, d1\, d2 \big(-1 + e^{4 i t} + 4 i\, e^{2 i t}\, t\big) - d2^2 \big(1 + 2\, e^{i t} - 2\, e^{3 i t} + e^{4 i t} + 4 i\, e^{2 i t}\, t\big) + \\ d1^2 \big(1 - 2\, e^{i t} + 2\, e^{3 i t} + e^{4 i t} + 4 i\, e^{2 i t}\, t\big)\Big) + \\ C2 \big(-i\, d2^2 \big(-1 + e^{4 i t} - 4 i\, e^{2 i t}\, t\big) - 2\, d1\, d2 \big(1 - 2\, e^{i t} + 2\, e^{3 i t} + e^{4 i t} - 4 i\, e^{2 i t}\, t\big) + \\ d1^2 \big(-i + 4 i\, e^{i t} + 4 i\, e^{3 i t} + i\, e^{4 i t} + 4\, e^{2 i t}\, t\big)\big)\big)\Big) \operatorname{Cos}\Big[\frac{t}{2}\Big] + e^{\frac{i t}{2}} C[1] \operatorname{Cos}\Big[\frac{t}{2}\Big] - \\ \frac{1}{4} e^{\frac{i t}{2}} \Big(\frac{1}{4} e^{-2 i t} \Big(a \big(i\, c1 + c2\big) \big(-2 i\, C1\, c2 + 2\, c1 \big(C1 - i\, C2\big) - 2\, c2\, C2 - d1\, D1 + \\ i\, D1\, d2 - \big(3 - 4 i\big)\, d1\, D2 + \big(4 + 3 i\big)\, d2\, D2\big) + 2 \big(i\, C1 + C2\big) \big(d1 - i\, d2\big)^2 G\Big) + \\ \frac{1}{4} e^{2 i t} \Big(a \big(c1 + i\, c2\big) \big(2\, C1\, c2 + 2\, c1 \big(-i\, C1 + C2\big) + i \big(2\, c2\, C2 + 3\, d1\, D1 + 3 i\, D1\, d2 + \\ \big(1 + 4 i\big)\, d1\, D2 - \big(4 - i\big)\, d2\, D2\big)\big) + 2 \big(-i\, C1 + C2\big) \big(d1 + i\, d2\big)^2 G\Big) + \\ e^{i t} \Big(a \big(c1^2\, C2 + c2 \big(-2 i\, C1\, c2 + c2\, C2 + i\, D1\, d2 + 2\, d1\, D2 - \big(2 - 3 i\big)\, d2\, D2\big) + \\ c1 \big(-2\, C1\, c2 + i\, d1 \big(D1 - \big(1 - 2 i\big)\, D2\big) + 2\, d2\, D2\big) + \\ \big(d1 + i\, d2\big) \big(C2 \big(d1 - i\, d2\big) - 2\, C1\, d2\big) G\Big) + \\ e^{-i t} \Big(-a \big(c1^2\, C2 + c2 \big(2 i\, C1\, c2 + c2\, C2 - i\, D1\, d2 + 2\, d1\, D2 - \big(2 + 3 i\big)\, d2\, D2\big) + \\ c1 \big(-2\, C1\, c2 - i\, d1\, D1 - \big(2 - i\big)\, d1\, D2 + 2\, d2\, D2\big)\big) - \\ \big(d1 - i\, d2\big) \big(C2 \big(d1 + i\, d2\big) - 2\, C1\, d2\big) G\Big) + \Big(a \big(-2\, c1^2 \big(C1 - i\, C2\big) + \\ c2 \big(2\, C1\, c2 - 2 i\, c2\, C2 + i\, d1\, D1 - 2\, D1\, d2 + \big(4 + 3 i\big)\, d1\, D2 - \big(2 - 4 i\big)\, d2\, D2\big) + \\ c1 \big(-4 i\, C1\, c2 - 4\, c2\, C2 + 2\, d1\, D1 + i\, D1\, d2 + \big(2 - 4 i\big)\, d1\, D2 + \big(4 + 3 i\big)\, d2\, D2\big)\big) - \\ 2 \big(C1 - i\, C2\big) \big(d1 + i\, d2\big)^2 G\Big)\, t\Big) \operatorname{Sin}\Big[\frac{t}{2}\Big] - e^{\frac{i t}{2}} C[2] \operatorname{Sin}\Big[\frac{t}{2}\Big]$$

In[•]:= **Expand[%73]**

Out[•]=
$$\frac{1}{4} a\, c1^2\, C1\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] + \frac{1}{4} a\, C1\, c2^2\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] - \frac{1}{2} i\, a\, c1^2\, C2\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] - \\ \frac{1}{2} a\, c1\, c2\, C2\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] - \frac{1}{2} a\, c1\, d1\, D1\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] + \frac{1}{4} i\, a\, c2\, d1\, D1\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] + \\ \frac{1}{4} i\, a\, c1\, D1\, d2\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] + i\, a\, c1\, d1\, D2\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] + \Big(\frac{1}{2} - \frac{i}{4}\Big) a\, c2\, d1\, D2\, e^{-\frac{i t}{2}} \operatorname{Cos}\Big[\frac{t}{2}\Big] +$$

$$\left(\frac{1}{2}-\frac{i}{4}\right) a\, c1\, d2\, D2\, e^{-\frac{i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{2} a\, c2\, d2\, D2\, e^{-\frac{i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{8} a\, c1^2\, C1\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{4} i\, a\, c1\, C1\, c2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{1}{8} a\, C1\, c2^2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{1}{8} i\, a\, c1^2\, C2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{4} a\, c1\, c2\, C2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{8} i\, a\, c2^2\, C2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{1}{16} a\, c1\, d1\, D1\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{16} i\, a\, c2\, d1\, D1\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{16} i\, a\, c1\, D1\, d2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{16} a\, c2\, D1\, d2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\left(\frac{3}{16}-\frac{i}{4}\right) a\, c1\, d1\, D2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \left(\frac{1}{4}+\frac{3 i}{16}\right) a\, c2\, d1\, D2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\left(\frac{1}{4}+\frac{3 i}{16}\right) a\, c1\, d2\, D2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \left(\frac{3}{16}-\frac{i}{4}\right) a\, c2\, d2\, D2\, e^{-\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{4} a\, c1^2\, C1\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{4} a\, C1\, c2^2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{2} i\, a\, c1^2\, C2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{2} a\, c1\, c2\, C2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{2} a\, c1\, d1\, D1\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{3}{4} i\, a\, c2\, d1\, D1\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\frac{3}{4} i\, a\, c1\, D1\, d2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] + a\, c2\, D1\, d2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] + (1+i)\, a\, c1\, d1\, D2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\left(\frac{1}{2}-\frac{3 i}{4}\right) a\, c2\, d1\, D2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \left(\frac{1}{2}-\frac{3 i}{4}\right) a\, c1\, d2\, D2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{2} a\, c2\, d2\, D2\, e^{\frac{3 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{8} a\, c1^2\, C1\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{4} i\, a\, c1\, C1\, c2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{8} a\, C1\, c2^2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{1}{8} i\, a\, c1^2\, C2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{1}{4} a\, c1\, c2\, C2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{8} i\, a\, c2^2\, C2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{3}{16} a\, c1\, d1\, D1\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{3}{16} i\, a\, c2\, d1\, D1\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] +$$
$$\frac{3}{16} i\, a\, c1\, D1\, d2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] - \frac{3}{16} a\, c2\, D1\, d2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] + \left(\frac{1}{16}+\frac{i}{4}\right) a\, c1\, d1\, D2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\left(\frac{1}{4}-\frac{i}{16}\right) a\, c2\, d1\, D2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] - \left(\frac{1}{4}-\frac{i}{16}\right) a\, c1\, d2\, D2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] -$$
$$\left(\frac{1}{16}+\frac{i}{4}\right) a\, c2\, d2\, D2\, e^{\frac{5 i t}{2}} \cos\left[\frac{t}{2}\right] + \frac{1}{4} C1\, d1^2\, e^{-\frac{i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{2} i\, C2\, d1^2\, e^{-\frac{i t}{2}} G \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{2} C2\, d1\, d2\, e^{-\frac{i t}{2}} G \cos\left[\frac{t}{2}\right] + \frac{1}{4} C1\, d2^2\, e^{-\frac{i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{8} C1\, d1^2\, e^{-\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{8} i\, C2\, d1^2\, e^{-\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] + \frac{1}{4} i\, C1\, d1\, d2\, e^{-\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] + \frac{1}{4} C2\, d1\, d2\, e^{-\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{8} C1\, d2^2\, e^{-\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{8} i\, C2\, d2^2\, e^{-\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{4} C1\, d1^2\, e^{\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{2} i\, C2\, d1^2\, e^{\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] + \frac{1}{2} C2\, d1\, d2\, e^{\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{4} C1\, d2^2\, e^{\frac{3 i t}{2}} G \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{8} C1\, d1^2\, e^{\frac{5 i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{8} i\, C2\, d1^2\, e^{\frac{5 i t}{2}} G \cos\left[\frac{t}{2}\right] - \frac{1}{4} i\, C1\, d1\, d2\, e^{\frac{5 i t}{2}} G \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{4} C2\, d1\, d2\, e^{\frac{5 i t}{2}} G \cos\left[\frac{t}{2}\right] + \frac{1}{8} C1\, d2^2\, e^{\frac{5 i t}{2}} G \cos\left[\frac{t}{2}\right] + \frac{1}{8} i\, C2\, d2^2\, e^{\frac{5 i t}{2}} G \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{2} i\, a\, c1^2\, C1\, e^{\frac{i t}{2}} t \cos\left[\frac{t}{2}\right] + a\, c1\, C1\, c2\, e^{\frac{i t}{2}} t \cos\left[\frac{t}{2}\right] + \frac{1}{2} i\, a\, C1\, c2^2\, e^{\frac{i t}{2}} t \cos\left[\frac{t}{2}\right] -$$
$$\frac{1}{2} a\, c1^2\, C2\, e^{\frac{i t}{2}} t \cos\left[\frac{t}{2}\right] - i\, a\, c1\, c2\, C2\, e^{\frac{i t}{2}} t \cos\left[\frac{t}{2}\right] + \frac{1}{2} a\, c2^2\, C2\, e^{\frac{i t}{2}} t \cos\left[\frac{t}{2}\right] -$$

$$\frac{1}{4} i\, a\, c1\, d1\, D1\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] - \frac{1}{2} a\, c2\, d1\, D1\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] - \frac{1}{2} a\, c1\, D1\, d2\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] -$$
$$\frac{3}{4} i\, a\, c2\, D1\, d2\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] + \left(1 + \frac{5 i}{4}\right) a\, c1\, d1\, D2\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] -$$
$$\left(\frac{1}{2} - i\right) a\, c2\, d1\, D2\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] - \left(\frac{1}{2} - i\right) a\, c1\, d2\, D2\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] -$$
$$\left(1 + \frac{i}{4}\right) a\, c2\, d2\, D2\, e^{\frac{i t}{2}}\, t \cos\left[\frac{t}{2}\right] - \frac{1}{2} i\, C1\, d1^2\, e^{\frac{i t}{2}}\, G\, t \cos\left[\frac{t}{2}\right] - \frac{1}{2} C2\, d1^2\, e^{\frac{i t}{2}}\, G\, t \cos\left[\frac{t}{2}\right] +$$
$$C1\, d1\, d2\, e^{\frac{i t}{2}}\, G\, t \cos\left[\frac{t}{2}\right] - i\, C2\, d1\, d2\, e^{\frac{i t}{2}}\, G\, t \cos\left[\frac{t}{2}\right] + \frac{1}{2} i\, C1\, d2^2\, e^{\frac{i t}{2}}\, G\, t \cos\left[\frac{t}{2}\right] +$$
$$\frac{1}{2} C2\, d2^2\, e^{\frac{i t}{2}}\, G\, t \cos\left[\frac{t}{2}\right] + e^{\frac{i t}{2}}\, C[1] \cos\left[\frac{t}{2}\right] - \frac{1}{2} a\, c1\, C1\, c2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\frac{1}{2} i\, a\, C1\, c2^2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{4} a\, c1^2\, C2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{4} a\, c2^2\, C2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{4} i\, a\, c1\, d1\, D1\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{4} i\, a\, c2\, D1\, d2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] - \left(\frac{1}{2} - \frac{i}{4}\right) a\, c1\, d1\, D2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\frac{1}{2} a\, c2\, d1\, D2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{2} a\, c1\, d2\, D2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] - \left(\frac{1}{2} + \frac{3 i}{4}\right) a\, c2\, d2\, D2\, e^{-\frac{i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{8} i\, a\, c1^2\, C1\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{4} a\, c1\, C1\, c2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{8} i\, a\, C1\, c2^2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{8} a\, c1^2\, C2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{4} i\, a\, c1\, c2\, C2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{8} a\, c2^2\, C2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\frac{1}{16} i\, a\, c1\, d1\, D1\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{16} a\, c2\, d1\, D1\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{16} a\, c1\, D1\, d2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{16} i\, a\, c2\, D1\, d2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \left(\frac{1}{4} + \frac{3 i}{16}\right) a\, c1\, d1\, D2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\left(\frac{3}{16} - \frac{i}{4}\right) a\, c2\, d1\, D2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \left(\frac{3}{16} - \frac{i}{4}\right) a\, c1\, d2\, D2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\left(\frac{1}{4} + \frac{3 i}{16}\right) a\, c2\, d2\, D2\, e^{-\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{2} a\, c1\, C1\, c2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{2} i\, a\, C1\, c2^2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{4} a\, c1^2\, C2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{4} a\, c2^2\, C2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{4} i\, a\, c1\, d1\, D1\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{4} i\, a\, c2\, D1\, d2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \left(\frac{1}{2} + \frac{i}{4}\right) a\, c1\, d1\, D2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{2} a\, c2\, d1\, D2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{2} a\, c1\, d2\, D2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \left(\frac{1}{2} - \frac{3 i}{4}\right) a\, c2\, d2\, D2\, e^{\frac{3 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{8} i\, a\, c1^2\, C1\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{4} a\, c1\, C1\, c2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{8} i\, a\, C1\, c2^2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{1}{8} a\, c1^2\, C2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] -$$
$$\frac{1}{4} i\, a\, c1\, c2\, C2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{1}{8} a\, c2^2\, C2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] - \frac{3}{16} i\, a\, c1\, d1\, D1\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\frac{3}{16} a\, c2\, d1\, D1\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{3}{16} a\, c1\, D1\, d2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] + \frac{3}{16} i\, a\, c2\, D1\, d2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\left(\frac{1}{4} - \frac{i}{16}\right) a\, c1\, d1\, D2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] + \left(\frac{1}{16} + \frac{i}{4}\right) a\, c2\, d1\, D2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\left(\frac{1}{16} + \frac{i}{4}\right) a\, c1\, d2\, D2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] - \left(\frac{1}{4} - \frac{i}{16}\right) a\, c2\, d2\, D2\, e^{\frac{5 i t}{2}} \sin\left[\frac{t}{2}\right] +$$
$$\frac{1}{4} C2\, d1^2\, e^{-\frac{i t}{2}}\, G \sin\left[\frac{t}{2}\right] - \frac{1}{2} C1\, d1\, d2\, e^{-\frac{i t}{2}}\, G \sin\left[\frac{t}{2}\right] + \frac{1}{2} i\, C1\, d2^2\, e^{-\frac{i t}{2}}\, G \sin\left[\frac{t}{2}\right] +$$

$$\frac{1}{4}\,C2\,d2^2\,e^{-\frac{i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{8}\,i\,C1\,d1^2\,e^{-\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{8}\,C2\,d1^2\,e^{-\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\frac{1}{4}\,C1\,d1\,d2\,e^{-\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{4}\,i\,C2\,d1\,d2\,e^{-\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{8}\,i\,C1\,d2^2\,e^{-\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+$$
$$\frac{1}{8}\,C2\,d2^2\,e^{-\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{4}\,C2\,d1^2\,e^{\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{2}\,C1\,d1\,d2\,e^{\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+$$
$$\frac{1}{2}\,i\,C1\,d2^2\,e^{\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{4}\,C2\,d2^2\,e^{\frac{3\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{8}\,i\,C1\,d1^2\,e^{\frac{5\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\frac{1}{8}\,C2\,d1^2\,e^{\frac{5\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{4}\,C1\,d1\,d2\,e^{\frac{5\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{4}\,i\,C2\,d1\,d2\,e^{\frac{5\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\frac{1}{8}\,i\,C1\,d2^2\,e^{\frac{5\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{8}\,C2\,d2^2\,e^{\frac{5\,i\,t}{2}}\,G\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{2}\,a\,c1^2\,C1\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]+$$
$$i\,a\,c1\,C1\,c2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{2}\,a\,C1\,c2^2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{2}\,i\,a\,c1^2\,C2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]+$$
$$a\,c1\,c2\,C2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{2}\,i\,a\,c2^2\,C2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{2}\,a\,c1\,d1\,D1\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\frac{1}{4}\,i\,a\,c2\,d1\,D1\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-\frac{1}{4}\,i\,a\,c1\,D1\,d2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{2}\,a\,c2\,D1\,d2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\left(\frac{1}{2}-i\right)a\,c1\,d1\,D2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-\left(1+\frac{3\,i}{4}\right)a\,c2\,d1\,D2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\left(1+\frac{3\,i}{4}\right)a\,c1\,d2\,D2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]+\left(\frac{1}{2}-i\right)a\,c2\,d2\,D2\,e^{\frac{i\,t}{2}}\,t\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{2}\,C1\,d1^2\,e^{\frac{i\,t}{2}}\,G\,t\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\frac{1}{2}\,i\,C2\,d1^2\,e^{\frac{i\,t}{2}}\,G\,t\,\text{Sin}\left[\frac{t}{2}\right]+i\,C1\,d1\,d2\,e^{\frac{i\,t}{2}}\,G\,t\,\text{Sin}\left[\frac{t}{2}\right]+C2\,d1\,d2\,e^{\frac{i\,t}{2}}\,G\,t\,\text{Sin}\left[\frac{t}{2}\right]-$$
$$\frac{1}{2}\,C1\,d2^2\,e^{\frac{i\,t}{2}}\,G\,t\,\text{Sin}\left[\frac{t}{2}\right]+\frac{1}{2}\,i\,C2\,d2^2\,e^{\frac{i\,t}{2}}\,G\,t\,\text{Sin}\left[\frac{t}{2}\right]-e^{\frac{i\,t}{2}}\,C[2]\,\text{Sin}\left[\frac{t}{2}\right]$$

In[•]:= **TrigReduce[%74]**

Out[•]=

$$\frac{1}{8}\,a\,c1^2\,C1+\frac{1}{4}\,i\,a\,c1\,C1\,c2+\frac{3}{8}\,a\,C1\,c2^2-\frac{3}{8}\,i\,a\,c1^2\,C2-\frac{1}{4}\,a\,c1\,c2\,C2-\frac{1}{8}\,i\,a\,c2^2\,C2-\frac{3}{8}\,a\,c1\,d1\,D1+$$
$$\frac{1}{8}\,i\,a\,c2\,d1\,D1+\frac{1}{8}\,i\,a\,c1\,D1\,d2-\frac{1}{8}\,a\,c2\,D1\,d2+\left(\frac{1}{8}+\frac{3\,i}{4}\right)a\,c1\,d1\,D2+\left(\frac{1}{4}-\frac{3\,i}{8}\right)a\,c2\,d1\,D2+$$
$$\left(\frac{1}{4}-\frac{3\,i}{8}\right)a\,c1\,d2\,D2-\left(\frac{5}{8}-\frac{i}{4}\right)a\,c2\,d2\,D2-\frac{1}{16}\,a\,c1\,d1\,D1\,e^{-i\,t}+\frac{1}{16}\,i\,a\,c2\,d1\,D1\,e^{-i\,t}+$$
$$\frac{1}{16}\,i\,a\,c1\,D1\,d2\,e^{-i\,t}+\frac{1}{16}\,a\,c2\,D1\,d2\,e^{-i\,t}+\frac{1}{16}\,a\,c1\,d1\,D2\,e^{-i\,t}-\frac{1}{16}\,i\,a\,c2\,d1\,D2\,e^{-i\,t}-$$
$$\frac{1}{16}\,i\,a\,c1\,d2\,D2\,e^{-i\,t}-\frac{1}{16}\,a\,c2\,d2\,D2\,e^{-i\,t}-\frac{1}{8}\,a\,c1^2\,C1\,e^{i\,t}+\frac{1}{4}\,i\,a\,c1\,C1\,c2\,e^{i\,t}-$$
$$\frac{3}{8}\,a\,C1\,c2^2\,e^{i\,t}-\frac{3}{8}\,i\,a\,c1^2\,C2\,e^{i\,t}+\frac{1}{4}\,a\,c1\,c2\,C2\,e^{i\,t}-\frac{1}{8}\,i\,a\,c2^2\,C2\,e^{i\,t}-\frac{1}{8}\,a\,c1\,d1\,D1\,e^{i\,t}-$$
$$\frac{3}{8}\,i\,a\,c2\,d1\,D1\,e^{i\,t}-\frac{3}{8}\,i\,a\,c1\,D1\,d2\,e^{i\,t}+\frac{5}{8}\,a\,c2\,D1\,d2\,e^{i\,t}+\left(\frac{3}{8}+\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,e^{i\,t}-$$
$$\left(\frac{1}{4}-\frac{i}{8}\right)a\,c2\,d1\,D2\,e^{i\,t}-\left(\frac{1}{4}-\frac{i}{8}\right)a\,c1\,d2\,D2\,e^{i\,t}+\left(\frac{1}{8}+\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{i\,t}-\frac{1}{4}\,a\,c1^2\,C1\,e^{2\,i\,t}-$$
$$\frac{1}{2}\,i\,a\,c1\,C1\,c2\,e^{2\,i\,t}+\frac{1}{4}\,a\,C1\,c2^2\,e^{2\,i\,t}-\frac{1}{4}\,i\,a\,c1^2\,C2\,e^{2\,i\,t}+\frac{1}{2}\,a\,c1\,c2\,C2\,e^{2\,i\,t}+\frac{1}{4}\,i\,a\,c2^2\,C2\,e^{2\,i\,t}-$$
$$\frac{3}{16}\,a\,c1\,d1\,D1\,e^{2\,i\,t}-\frac{3}{16}\,i\,a\,c2\,d1\,D1\,e^{2\,i\,t}-\frac{3}{16}\,i\,a\,c1\,D1\,d2\,e^{2\,i\,t}+\frac{3}{16}\,a\,c2\,D1\,d2\,e^{2\,i\,t}+$$
$$\left(\frac{11}{16}+\frac{i}{2}\right)a\,c1\,d1\,D2\,e^{2\,i\,t}-\left(\frac{1}{2}-\frac{11\,i}{16}\right)a\,c2\,d1\,D2\,e^{2\,i\,t}-\left(\frac{1}{2}-\frac{11\,i}{16}\right)a\,c1\,d2\,D2\,e^{2\,i\,t}-$$
$$\left(\frac{11}{16}+\frac{i}{2}\right)a\,c2\,d2\,D2\,e^{2\,i\,t}+\frac{1}{8}\,C1\,d1^2\,G-\frac{3}{8}\,i\,C2\,d1^2\,G+\frac{1}{4}\,i\,C1\,d1\,d2\,G-\frac{1}{4}\,C2\,d1\,d2\,G+$$
$$\frac{3}{8}\,C1\,d2^2\,G-\frac{1}{8}\,i\,C2\,d2^2\,G-\frac{1}{8}\,C1\,d1^2\,e^{i\,t}\,G-\frac{3}{8}\,i\,C2\,d1^2\,e^{i\,t}\,G+\frac{1}{4}\,i\,C1\,d1\,d2\,e^{i\,t}\,G+$$
$$\frac{1}{4}\,C2\,d1\,d2\,e^{i\,t}\,G-\frac{3}{8}\,C1\,d2^2\,e^{i\,t}\,G-\frac{1}{8}\,i\,C2\,d2^2\,e^{i\,t}\,G-\frac{1}{4}\,C1\,d1^2\,e^{2\,i\,t}\,G-\frac{1}{4}\,i\,C2\,d1^2\,e^{2\,i\,t}\,G-$$
$$\frac{1}{2}\,i\,C1\,d1\,d2\,e^{2\,i\,t}\,G+\frac{1}{2}\,C2\,d1\,d2\,e^{2\,i\,t}\,G+\frac{1}{4}\,C1\,d2^2\,e^{2\,i\,t}\,G+\frac{1}{4}\,i\,C2\,d2^2\,e^{2\,i\,t}\,G-$$
$$\frac{3}{8}\,i\,a\,c1\,d1\,D1\,t-\frac{1}{8}\,a\,c2\,d1\,D1\,t-\frac{1}{8}\,a\,c1\,D1\,d2\,t-\frac{1}{8}\,i\,a\,c2\,D1\,d2\,t+\frac{3}{8}\,i\,a\,c1\,d1\,D2\,t+$$
$$\frac{1}{8}\,a\,c2\,d1\,D2\,t+\frac{1}{8}\,a\,c1\,d2\,D2\,t+\frac{1}{8}\,i\,a\,c2\,d2\,D2\,t-\frac{1}{2}\,i\,a\,c1^2\,C1\,e^{i\,t}\,t+a\,c1\,C1\,c2\,e^{i\,t}\,t+$$
$$\frac{1}{2}\,i\,a\,C1\,c2^2\,e^{i\,t}\,t-\frac{1}{2}\,a\,c1^2\,C2\,e^{i\,t}\,t-i\,a\,c1\,c2\,C2\,e^{i\,t}\,t+\frac{1}{2}\,a\,c2^2\,C2\,e^{i\,t}\,t+\frac{1}{8}\,i\,a\,c1\,d1\,D1\,e^{i\,t}\,t-$$
$$\frac{3}{8}\,a\,c2\,d1\,D1\,e^{i\,t}\,t-\frac{3}{8}\,a\,c1\,D1\,d2\,e^{i\,t}\,t-\frac{5}{8}\,i\,a\,c2\,D1\,d2\,e^{i\,t}\,t+\left(1+\frac{7\,i}{8}\right)a\,c1\,d1\,D2\,e^{i\,t}\,t-$$
$$\left(\frac{5}{8}-i\right)a\,c2\,d1\,D2\,e^{i\,t}\,t-\left(\frac{5}{8}-i\right)a\,c1\,d2\,D2\,e^{i\,t}\,t-\left(1+\frac{3\,i}{8}\right)a\,c2\,d2\,D2\,e^{i\,t}\,t-$$
$$\frac{1}{2}\,i\,C1\,d1^2\,e^{i\,t}\,G\,t-\frac{1}{2}\,C2\,d1^2\,e^{i\,t}\,G\,t+C1\,d1\,d2\,e^{i\,t}\,G\,t-i\,C2\,d1\,d2\,e^{i\,t}\,G\,t+$$
$$\frac{1}{2}\,i\,C1\,d2^2\,e^{i\,t}\,G\,t+\frac{1}{2}\,C2\,d2^2\,e^{i\,t}\,G\,t+\frac{C[1]}{2}+\frac{1}{2}\,e^{i\,t}\,C[1]-\frac{1}{2}\,i\,C[2]+\frac{1}{2}\,i\,e^{i\,t}\,C[2]$$

In[•]:= **Collect[%, t * Exp[I * t]]**

Out[•]=
$$\frac{1}{8}\,a\,c1^2\,C1+\frac{1}{4}\,i\,a\,c1\,C1\,c2+\frac{3}{8}\,a\,C1\,c2^2-\frac{3}{8}\,i\,a\,c1^2\,C2-\frac{1}{4}\,a\,c1\,c2\,C2-\frac{1}{8}\,i\,a\,c2^2\,C2-\frac{3}{8}\,a\,c1\,d1\,D1+$$
$$\frac{1}{8}\,i\,a\,c2\,d1\,D1+\frac{1}{8}\,i\,a\,c1\,D1\,d2-\frac{1}{8}\,a\,c2\,D1\,d2+\left(\frac{1}{8}+\frac{3\,i}{4}\right)a\,c1\,d1\,D2+\left(\frac{1}{4}-\frac{3\,i}{8}\right)a\,c2\,d1\,D2+$$
$$\left(\frac{1}{4}-\frac{3\,i}{8}\right)a\,c1\,d2\,D2-\left(\frac{5}{8}-\frac{i}{4}\right)a\,c2\,d2\,D2-\frac{1}{16}\,a\,c1\,d1\,D1\,e^{-i\,t}+\frac{1}{16}\,i\,a\,c2\,d1\,D1\,e^{-i\,t}+$$
$$\frac{1}{16}\,i\,a\,c1\,D1\,d2\,e^{-i\,t}+\frac{1}{16}\,a\,c2\,D1\,d2\,e^{-i\,t}+\frac{1}{16}\,a\,c1\,d1\,D2\,e^{-i\,t}-\frac{1}{16}\,i\,a\,c2\,d1\,D2\,e^{-i\,t}-$$
$$\frac{1}{16}\,i\,a\,c1\,d2\,D2\,e^{-i\,t}-\frac{1}{16}\,a\,c2\,d2\,D2\,e^{-i\,t}-\frac{1}{8}\,a\,c1^2\,C1\,e^{i\,t}+\frac{1}{4}\,i\,a\,c1\,C1\,c2\,e^{i\,t}-$$
$$\frac{3}{8}\,a\,C1\,c2^2\,e^{i\,t}-\frac{3}{8}\,i\,a\,c1^2\,C2\,e^{i\,t}+\frac{1}{4}\,a\,c1\,c2\,C2\,e^{i\,t}-\frac{1}{8}\,i\,a\,c2^2\,C2\,e^{i\,t}-\frac{1}{8}\,a\,c1\,d1\,D1\,e^{i\,t}-$$
$$\frac{3}{8}\,i\,a\,c2\,d1\,D1\,e^{i\,t}-\frac{3}{8}\,i\,a\,c1\,D1\,d2\,e^{i\,t}+\frac{5}{8}\,a\,c2\,D1\,d2\,e^{i\,t}+\left(\frac{3}{8}+\frac{3\,i}{4}\right)a\,c1\,d1\,D2\,e^{i\,t}-$$
$$\left(\frac{1}{4}-\frac{i}{8}\right)a\,c2\,d1\,D2\,e^{i\,t}-\left(\frac{1}{4}-\frac{i}{8}\right)a\,c1\,d2\,D2\,e^{i\,t}+\left(\frac{1}{8}+\frac{i}{4}\right)a\,c2\,d2\,D2\,e^{i\,t}-\frac{1}{4}\,a\,c1^2\,C1\,e^{2\,i\,t}-$$
$$\frac{1}{2}\,i\,a\,c1\,C1\,c2\,e^{2\,i\,t}+\frac{1}{4}\,a\,C1\,c2^2\,e^{2\,i\,t}-\frac{1}{4}\,i\,a\,c1^2\,C2\,e^{2\,i\,t}+\frac{1}{2}\,a\,c1\,c2\,C2\,e^{2\,i\,t}+\frac{1}{4}\,i\,a\,c2^2\,C2\,e^{2\,i\,t}-$$
$$\frac{3}{16}\,a\,c1\,d1\,D1\,e^{2\,i\,t}-\frac{3}{16}\,i\,a\,c2\,d1\,D1\,e^{2\,i\,t}-\frac{3}{16}\,i\,a\,c1\,D1\,d2\,e^{2\,i\,t}+\frac{3}{16}\,a\,c2\,D1\,d2\,e^{2\,i\,t}+$$
$$\left(\frac{11}{16}+\frac{i}{2}\right)a\,c1\,d1\,D2\,e^{2\,i\,t}-\left(\frac{1}{2}-\frac{11\,i}{16}\right)a\,c2\,d1\,D2\,e^{2\,i\,t}-\left(\frac{1}{2}-\frac{11\,i}{16}\right)a\,c1\,d2\,D2\,e^{2\,i\,t}-$$
$$\left(\frac{11}{16}+\frac{i}{2}\right)a\,c2\,d2\,D2\,e^{2\,i\,t}+\frac{1}{8}\,C1\,d1^2\,G-\frac{3}{8}\,i\,C2\,d1^2\,G+\frac{1}{4}\,i\,C1\,d1\,d2\,G-\frac{1}{4}\,C2\,d1\,d2\,G+$$
$$\frac{3}{8}\,C1\,d2^2\,G-\frac{1}{8}\,i\,C2\,d2^2\,G-\frac{1}{8}\,C1\,d1^2\,e^{i\,t}\,G-\frac{3}{8}\,i\,C2\,d1^2\,e^{i\,t}\,G+\frac{1}{4}\,i\,C1\,d1\,d2\,e^{i\,t}\,G+$$
$$\frac{1}{4}\,C2\,d1\,d2\,e^{i\,t}\,G-\frac{3}{8}\,C1\,d2^2\,e^{i\,t}\,G-\frac{1}{8}\,i\,C2\,d2^2\,e^{i\,t}\,G-\frac{1}{4}\,C1\,d1^2\,e^{2\,i\,t}\,G-\frac{1}{4}\,i\,C2\,d1^2\,e^{2\,i\,t}\,G-$$
$$\frac{1}{2}\,i\,C1\,d1\,d2\,e^{2\,i\,t}\,G+\frac{1}{2}\,C2\,d1\,d2\,e^{2\,i\,t}\,G+\frac{1}{4}\,C1\,d2^2\,e^{2\,i\,t}\,G+\frac{1}{4}\,i\,C2\,d2^2\,e^{2\,i\,t}\,G-\frac{3}{8}\,i\,a\,c1\,d1\,D1\,t-$$
$$\frac{1}{8}\,a\,c2\,d1\,D1\,t-\frac{1}{8}\,a\,c1\,D1\,d2\,t-\frac{1}{8}\,i\,a\,c2\,D1\,d2\,t+\frac{3}{8}\,i\,a\,c1\,d1\,D2\,t+\frac{1}{8}\,a\,c2\,d1\,D2\,t+$$
$$\frac{1}{8}\,a\,c1\,d2\,D2\,t+\frac{1}{8}\,i\,a\,c2\,d2\,D2\,t+e^{i\,t}\left(-\frac{1}{2}\,i\,a\,c1^2\,C1+a\,c1\,C1\,c2+\frac{1}{2}\,i\,a\,C1\,c2^2-\frac{1}{2}\,a\,c1^2\,C2-\right.$$
$$i\,a\,c1\,c2\,C2+\frac{1}{2}\,a\,c2^2\,C2+\frac{1}{8}\,i\,a\,c1\,d1\,D1-\frac{3}{8}\,a\,c2\,d1\,D1-\frac{3}{8}\,a\,c1\,D1\,d2-\frac{5}{8}\,i\,a\,c2\,D1\,d2+$$
$$\left(1+\frac{7\,i}{8}\right)a\,c1\,d1\,D2-\left(\frac{5}{8}-i\right)a\,c2\,d1\,D2-\left(\frac{5}{8}-i\right)a\,c1\,d2\,D2-\left(1+\frac{3\,i}{8}\right)a\,c2\,d2\,D2-$$
$$\left.\frac{1}{2}\,i\,C1\,d1^2\,G-\frac{1}{2}\,C2\,d1^2\,G+C1\,d1\,d2\,G-i\,C2\,d1\,d2\,G+\frac{1}{2}\,i\,C1\,d2^2\,G+\frac{1}{2}\,C2\,d2^2\,G\right)t+$$
$$\frac{C[1]}{2}+\frac{1}{2}\,e^{i\,t}\,C[1]-\frac{1}{2}\,i\,C[2]+\frac{1}{2}\,i\,e^{i\,t}\,C[2]$$

In[•]:=
$$-\frac{1}{2}\,i\,a\,c1^2\,C1 + a\,c1\,C1\,c2 + \frac{1}{2}\,i\,a\,C1\,c2^2 - \frac{1}{2}\,a\,c1^2\,C2 - i\,a\,c1\,c2\,C2 + \frac{1}{2}\,a\,c2^2\,C2 + \frac{1}{8}\,i\,a\,c1\,d1\,D1 - \frac{3}{8}\,a\,c2\,d1\,D1 - \frac{3}{8}\,a\,c1\,D1\,d2 - \frac{5}{8}\,i\,a\,c2\,D1\,d2 + \left(1 + \frac{7\,i}{8}\right) a\,c1\,d1\,D2 - \left(\frac{5}{8} - i\right) a\,c2\,d1\,D2 - \left(\frac{5}{8} - i\right) a\,c1\,d2\,D2 - \left(1 + \frac{3\,i}{8}\right) a\,c2\,d2\,D2 - \frac{1}{2}\,i\,C1\,d1^2\,G - \frac{1}{2}\,C2\,d1^2\,G + C1\,d1\,d2\,G - i\,C2\,d1\,d2\,G + \frac{1}{2}\,i\,C1\,d2^2\,G + \frac{1}{2}\,C2\,d2^2\,G$$

Out[•]=
$$-\frac{1}{2}\,i\,a\,c1^2\,C1 + a\,c1\,C1\,c2 + \frac{1}{2}\,i\,a\,C1\,c2^2 - \frac{1}{2}\,a\,c1^2\,C2 - i\,a\,c1\,c2\,C2 + \frac{1}{2}\,a\,c2^2\,C2 + \frac{1}{8}\,i\,a\,c1\,d1\,D1 - \frac{3}{8}\,a\,c2\,d1\,D1 - \frac{3}{8}\,a\,c1\,D1\,d2 - \frac{5}{8}\,i\,a\,c2\,D1\,d2 + \left(1 + \frac{7\,i}{8}\right) a\,c1\,d1\,D2 - \left(\frac{5}{8} - i\right) a\,c2\,d1\,D2 - \left(\frac{5}{8} - i\right) a\,c1\,d2\,D2 - \left(1 + \frac{3\,i}{8}\right) a\,c2\,d2\,D2 - \frac{1}{2}\,i\,C1\,d1^2\,G - \frac{1}{2}\,C2\,d1^2\,G + C1\,d1\,d2\,G - i\,C2\,d1\,d2\,G + \frac{1}{2}\,i\,C1\,d2^2\,G + \frac{1}{2}\,C2\,d2^2\,G$$

In[•]:=
$$\text{z23temp} := -\frac{1}{2}\,i\,a\,c1^2\,C1 + a\,c1\,C1\,c2 + \frac{1}{2}\,i\,a\,C1\,c2^2 - \frac{1}{2}\,a\,c1^2\,C2 - i\,a\,c1\,c2\,C2 + \frac{1}{2}\,a\,c2^2\,C2 + \frac{1}{8}\,i\,a\,c1\,d1\,D1 - \frac{3}{8}\,a\,c2\,d1\,D1 - \frac{3}{8}\,a\,c1\,D1\,d2 - \frac{5}{8}\,i\,a\,c2\,D1\,d2 + \left(1 + \frac{7\,i}{8}\right) a\,c1\,d1\,D2 - \left(\frac{5}{8} - i\right) a\,c2\,d1\,D2 - \left(\frac{5}{8} - i\right) a\,c1\,d2\,D2 - \left(1 + \frac{3\,i}{8}\right) a\,c2\,d2\,D2 - \frac{1}{2}\,i\,C1\,d1^2\,G - \frac{1}{2}\,C2\,d1^2\,G + C1\,d1\,d2\,G - i\,C2\,d1\,d2\,G + \frac{1}{2}\,i\,C1\,d2^2\,G + \frac{1}{2}\,C2\,d2^2\,G$$

In[•]:=
$$\text{z21}$$

Out[•]=
$$-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1 + e^{-i\,t}\right) + \frac{1}{2}\,c1\,e^{i\,t}\left(1 + e^{-i\,t}\right)$$

In[•]:=
$$\text{p21}$$

Out[•]=
$$\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1 + e^{-i\,t}\right) + \frac{1}{2}\,c2\,e^{i\,t}\left(1 + e^{-i\,t}\right)$$

In[•]:=
$$\text{z21}$$

Out[•]=
$$-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1 + e^{-i\,t}\right) + \frac{1}{2}\,c1\,e^{i\,t}\left(1 + e^{-i\,t}\right)$$

In[•]:=
$$\text{Expand}\left[-\frac{1}{2}\,i\,c2\,e^{i\,t}\left(-1 + e^{-i\,t}\right) + \frac{1}{2}\,c1\,e^{i\,t}\left(1 + e^{-i\,t}\right)\right]$$

Out[•]=
$$\frac{c1}{2} - \frac{i\,c2}{2} + \frac{1}{2}\,c1\,e^{i\,t} + \frac{1}{2}\,i\,c2\,e^{i\,t}$$

In[•]:=
$$\text{p21}$$

Out[•]=
$$\frac{1}{2}\,i\,c1\,e^{i\,t}\left(-1 + e^{-i\,t}\right) + \frac{1}{2}\,c2\,e^{i\,t}\left(1 + e^{-i\,t}\right)$$

In[•]:= **Expand[$\frac{1}{2}$ i c1 $e^{i t}$ (-1 + $e^{-i t}$) + $\frac{1}{2}$ c2 $e^{i t}$ (1 + $e^{-i t}$)]**

Out[•]= $\frac{i\ c1}{2} + \frac{c2}{2} - \frac{1}{2}\ i\ c1\ e^{i t} + \frac{1}{2}\ c2\ e^{i t}$

In[•]:= **z21 /. t → 0**

Out[•]= c1

In[•]:= **p21 /. t → 0**

Out[•]= c2

In[•]:= **z21 /. {c1 → 1 , c2 → -I}**

Out[•]= $-\frac{1}{2}\ e^{i t}\ (-1 + e^{-i t}) + \frac{1}{2}\ e^{i t}\ (1 + e^{-i t})$

In[•]:= **Simplify[$-\frac{1}{2}\ e^{i t}\ (-1 + e^{-i t}) + \frac{1}{2}\ e^{i t}\ (1 + e^{-i t})$]**

Out[•]= $e^{i t}$

In[•]:= **p21 /. {c1 → 1 , c2 → -I}**

Out[•]= $\frac{1}{2}\ i\ e^{i t}\ (-1 + e^{-i t}) - \frac{1}{2}\ i\ e^{i t}\ (1 + e^{-i t})$

In[•]:= **Simplify[$\frac{1}{2}\ i\ e^{i t}\ (-1 + e^{-i t}) - \frac{1}{2}\ i\ e^{i t}\ (1 + e^{-i t})$]**

Out[•]= $-i\ e^{i t}$

In[•]:= **z23temp /. {c1 → 1 , c2 → -I}**

Out[•]= $-2\ i\ a\ C1 - 2\ a\ C2 + \frac{1}{2}\ i\ a\ d1\ D1 - a\ D1\ d2 + \left(2 + \frac{3\ i}{2}\right)\ a\ d1\ D2 - (1 - 2\ i)\ a\ d2\ D2 -$
$\frac{1}{2}\ i\ C1\ d1^2\ G - \frac{1}{2}\ C2\ d1^2\ G + C1\ d1\ d2\ G - i\ C2\ d1\ d2\ G + \frac{1}{2}\ i\ C1\ d2^2\ G + \frac{1}{2}\ C2\ d2^2\ G$

In[•]:= **Simplify[$-2\ i\ a\ C1 - 2\ a\ C2 + \frac{1}{2}\ i\ a\ d1\ D1 - a\ D1\ d2 + \left(2 + \frac{3\ i}{2}\right)\ a\ d1\ D2 - (1 - 2\ i)\ a\ d2\ D2 -$**
$\frac{1}{2}\ i\ C1\ d1^2\ G - \frac{1}{2}\ C2\ d1^2\ G + C1\ d1\ d2\ G - i\ C2\ d1\ d2\ G + \frac{1}{2}\ i\ C1\ d2^2\ G + \frac{1}{2}\ C2\ d2^2\ G$]

Out[•]= $\frac{1}{2}\ \Big(a\ (-4\ i\ C1 - 4\ C2 + i\ d1\ D1 - 2\ D1\ d2 + (4 + 3\ i)\ d1\ D2 - (2 - 4\ i)\ d2\ D2) -$
$i\ (C1 - i\ C2)\ (d1 + i\ d2)^2\ G\Big)$

In[•]:=
```
Expand[1/2 (a (-4 i C1 - 4 C2 + i d1 D1 - 2 D1 d2 + (4 + 3 i) d1 D2 - (2 - 4 i) d2 D2) -
      i (C1 - i C2) (d1 + i d2)^2 G)]
```
Out[•]=
$$-2\,i\,a\,C1-2\,a\,C2+\frac{1}{2}\,i\,a\,d1\,D1-a\,D1\,d2+\left(2+\frac{3\,i}{2}\right)a\,d1\,D2-(1-2\,i)\,a\,d2\,D2-\frac{1}{2}\,i\,C1\,d1^2\,G-\frac{1}{2}\,C2\,d1^2\,G+C1\,d1\,d2\,G-i\,C2\,d1\,d2\,G+\frac{1}{2}\,i\,C1\,d2^2\,G+\frac{1}{2}\,C2\,d2^2\,G$$

In[•]:=
```
z23temp /. {c1 → 1 , c2 → -I, C1 → 1, C2 → I}
```
Out[•]=
$$-4\,i\,a+\frac{1}{2}\,i\,a\,d1\,D1-a\,D1\,d2+\left(2+\frac{3\,i}{2}\right)a\,d1\,D2-(1-2\,i)\,a\,d2\,D2-i\,d1^2\,G+2\,d1\,d2\,G+i\,d2^2\,G$$

In[•]:=
```
Simplify[
  -4 i a + 1/2 i a d1 D1 - a D1 d2 + (2 + 3 i/2) a d1 D2 - (1 - 2 i) a d2 D2 - i d1^2 G + 2 d1 d2 G + i d2^2 G]
```
Out[•]=
$$\frac{1}{2}\,i\,\left(a\,(-8+2\,i\,D1\,d2+(4+2\,i)\,d2\,D2+d1\,(D1+(3-4\,i)\,D2))-2\,(d1+i\,d2)^2\,G\right)$$

In[•]:=
```
Expand[1/2 i (a (-8 + 2 i D1 d2 + (4 + 2 i) d2 D2 + d1 (D1 + (3 - 4 i) D2)) - 2 (d1 + i d2)^2 G)]
```
Out[•]=
$$-4\,i\,a+\frac{1}{2}\,i\,a\,d1\,D1-a\,D1\,d2+\left(2+\frac{3\,i}{2}\right)a\,d1\,D2-(1-2\,i)\,a\,d2\,D2-i\,d1^2\,G+2\,d1\,d2\,G+i\,d2^2\,G$$

In[•]:=
```
% /. {d1 → c, D1 → k, d2 → I * c, D2 → -I * k}
```
Out[•]=
$$-4\,i\,a+\left(\frac{1}{2}-\frac{i}{2}\right)a\,c\,k$$

In[•]:=
```
z3st /.  {c1 → 1 , c2 → -I, C1 → 1, C2 → I, d1 → c, D1 → k, d2 → I * c, D2 → -I * k}
```
Out[•]=
$$\left(\frac{1}{2}\,c\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,c\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+s^3\,z33$$

In[•]:=
```
Simplify[(1/2 c e^(i t) (-1 + e^(-i t)) + 1/2 c e^(i t) (1 + e^(-i t))) s + s^3 z33]
```
Out[•]=
$$s\left(c+s^2\,z33\right)$$

In[•]:=
```
p3st /. {c1 → 1 , c2 → -I, C1 → 1, C2 → I, d1 → c, D1 → k, d2 → I * c, D2 → -I * k}
```
Out[•]=
$$\left(\frac{1}{2}\,i\,c\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,i\,c\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3$$

In[•]:=
```
∂t ((1/2 i c e^(i t) (-1 + e^(-i t)) + 1/2 i c e^(i t) (1 + e^(-i t))) s + p33 s^3)
```
Out[•]=
$$\left(c-\frac{1}{2}\,c\,e^{i\,t}\left(-1+e^{-i\,t}\right)-\frac{1}{2}\,c\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s$$

In[•]:=
```
p3st /. {c1 → 1 , c2 → -I, C1 → 1, C2 → I, d1 → c, D1 → k, d2 → I * c, D2 → -I * k}
```
Out[•]=
$$\left(\frac{1}{2}\,i\,c\,e^{i\,t}\left(-1+e^{-i\,t}\right)+\frac{1}{2}\,i\,c\,e^{i\,t}\left(1+e^{-i\,t}\right)\right)s+p33\,s^3$$

In[•]:=
```
Simplify[(1/2 i c e^(i t) (-1 + e^(-i t)) + 1/2 i c e^(i t) (1 + e^(-i t))) s + p33 s^3]
```

Out[•]=
$$i\, c\, s + p33\, s^3$$

In[•]:=
$$
\begin{aligned}
z33full :=\ & \frac{1}{8} a\, c1^2\, C1 + \frac{1}{4} i\, a\, c1\, C1\, c2 + \frac{3}{8} a\, C1\, c2^2 - \frac{3}{8} i\, a\, c1^2\, C2 - \frac{1}{4} a\, c1\, c2\, C2 - \frac{1}{8} i\, a\, c2^2\, C2 - \\
& \frac{3}{8} a\, c1\, d1\, D1 + \frac{1}{8} i\, a\, c2\, d1\, D1 + \frac{1}{8} i\, a\, c1\, D1\, d2 - \frac{1}{8} a\, c2\, D1\, d2 + \left(\frac{1}{8} + \frac{3\,i}{4}\right) a\, c1\, d1\, D2 + \\
& \left(\frac{1}{4} - \frac{3\,i}{8}\right) a\, c2\, d1\, D2 + \left(\frac{1}{4} - \frac{3\,i}{8}\right) a\, c1\, d2\, D2 - \left(\frac{5}{8} - \frac{i}{4}\right) a\, c2\, d2\, D2 - \frac{1}{16} a\, c1\, d1\, D1\, e^{-i\,t} + \\
& \frac{1}{16} i\, a\, c2\, d1\, D1\, e^{-i\,t} + \frac{1}{16} i\, a\, c1\, D1\, d2\, e^{-i\,t} + \frac{1}{16} a\, c2\, D1\, d2\, e^{-i\,t} + \frac{1}{16} a\, c1\, d1\, D2\, e^{-i\,t} - \\
& \frac{1}{16} i\, a\, c2\, d1\, D2\, e^{-i\,t} - \frac{1}{16} i\, a\, c1\, d2\, D2\, e^{-i\,t} - \frac{1}{16} a\, c2\, d2\, D2\, e^{-i\,t} - \frac{1}{8} a\, c1^2\, C1\, e^{i\,t} + \\
& \frac{1}{4} i\, a\, c1\, C1\, c2\, e^{i\,t} - \frac{3}{8} a\, C1\, c2^2\, e^{i\,t} - \frac{3}{8} i\, a\, c1^2\, C2\, e^{i\,t} + \frac{1}{4} a\, c1\, c2\, C2\, e^{i\,t} - \frac{1}{8} i\, a\, c2^2\, C2\, e^{i\,t} - \\
& \frac{1}{8} a\, c1\, d1\, D1\, e^{i\,t} - \frac{3}{8} i\, a\, c2\, d1\, D1\, e^{i\,t} - \frac{3}{8} i\, a\, c1\, D1\, d2\, e^{i\,t} + \frac{5}{8} a\, c2\, D1\, d2\, e^{i\,t} + \\
& \left(\frac{3}{8} + \frac{3\,i}{4}\right) a\, c1\, d1\, D2\, e^{i\,t} - \left(\frac{1}{4} - \frac{i}{8}\right) a\, c2\, d1\, D2\, e^{i\,t} - \left(\frac{1}{4} - \frac{i}{8}\right) a\, c1\, d2\, D2\, e^{i\,t} + \\
& \left(\frac{1}{8} + \frac{i}{4}\right) a\, c2\, d2\, D2\, e^{i\,t} - \frac{1}{4} a\, c1^2\, C1\, e^{2\,i\,t} - \frac{1}{2} i\, a\, c1\, C1\, c2\, e^{2\,i\,t} + \frac{1}{4} a\, C1\, c2^2\, e^{2\,i\,t} - \\
& \frac{1}{4} i\, a\, c1^2\, C2\, e^{2\,i\,t} + \frac{1}{2} a\, c1\, c2\, C2\, e^{2\,i\,t} + \frac{1}{4} i\, a\, c2^2\, C2\, e^{2\,i\,t} - \frac{3}{16} a\, c1\, d1\, D1\, e^{2\,i\,t} - \\
& \frac{3}{16} i\, a\, c2\, d1\, D1\, e^{2\,i\,t} - \frac{3}{16} i\, a\, c1\, D1\, d2\, e^{2\,i\,t} + \frac{3}{16} a\, c2\, D1\, d2\, e^{2\,i\,t} + \left(\frac{11}{16} + \frac{i}{2}\right) a\, c1\, d1\, D2\, e^{2\,i\,t} - \\
& \left(\frac{1}{2} - \frac{11\,i}{16}\right) a\, c2\, d1\, D2\, e^{2\,i\,t} - \left(\frac{1}{2} - \frac{11\,i}{16}\right) a\, c1\, d2\, D2\, e^{2\,i\,t} - \left(\frac{11}{16} + \frac{i}{2}\right) a\, c2\, d2\, D2\, e^{2\,i\,t} + \\
& \frac{1}{8} C1\, d1^2\, G - \frac{3}{8} i\, C2\, d1^2\, G + \frac{1}{4} i\, C1\, d1\, d2\, G - \frac{1}{4} C2\, d1\, d2\, G + \frac{3}{8} C1\, d2^2\, G - \frac{1}{8} i\, C2\, d2^2\, G - \\
& \frac{1}{8} C1\, d1^2\, e^{i\,t}\, G - \frac{3}{8} i\, C2\, d1^2\, e^{i\,t}\, G + \frac{1}{4} i\, C1\, d1\, d2\, e^{i\,t}\, G + \frac{1}{4} C2\, d1\, d2\, e^{i\,t}\, G - \frac{3}{8} C1\, d2^2\, e^{i\,t}\, G - \\
& \frac{1}{8} i\, C2\, d2^2\, e^{i\,t}\, G - \frac{1}{4} C1\, d1^2\, e^{2\,i\,t}\, G - \frac{1}{4} i\, C2\, d1^2\, e^{2\,i\,t}\, G - \frac{1}{2} i\, C1\, d1\, d2\, e^{2\,i\,t}\, G + \\
& \frac{1}{2} C2\, d1\, d2\, e^{2\,i\,t}\, G + \frac{1}{4} C1\, d2^2\, e^{2\,i\,t}\, G + \frac{1}{4} i\, C2\, d2^2\, e^{2\,i\,t}\, G - \frac{3}{8} i\, a\, c1\, d1\, D1\, t - \frac{1}{8} a\, c2\, d1\, D1\, t - \\
& \frac{1}{8} a\, c1\, D1\, d2\, t - \frac{1}{8} i\, a\, c2\, D1\, d2\, t + \frac{3}{8} i\, a\, c1\, d1\, D2\, t + \frac{1}{8} a\, c2\, d1\, D2\, t + \frac{1}{8} a\, c1\, d2\, D2\, t + \\
& \frac{1}{8} i\, a\, c2\, d2\, D2\, t - \frac{1}{2} i\, a\, c1^2\, C1\, e^{i\,t}\, t + a\, c1\, C1\, c2\, e^{i\,t}\, t + \frac{1}{2} i\, a\, C1\, c2^2\, e^{i\,t}\, t - \frac{1}{2} a\, c1^2\, C2\, e^{i\,t}\, t - \\
& i\, a\, c1\, c2\, C2\, e^{i\,t}\, t + \frac{1}{2} a\, c2^2\, C2\, e^{i\,t}\, t + \frac{1}{8} i\, a\, c1\, d1\, D1\, e^{i\,t}\, t - \frac{3}{8} a\, c2\, d1\, D1\, e^{i\,t}\, t - \\
& \frac{3}{8} a\, c1\, D1\, d2\, e^{i\,t}\, t - \frac{5}{8} i\, a\, c2\, D1\, d2\, e^{i\,t}\, t + \left(1 + \frac{7\,i}{8}\right) a\, c1\, d1\, D2\, e^{i\,t}\, t - \left(\frac{5}{8} - i\right) a\, c2\, d1\, D2\, e^{i\,t}\, t - \\
& \left(\frac{5}{8} - i\right) a\, c1\, d2\, D2\, e^{i\,t}\, t - \left(1 + \frac{3\,i}{8}\right) a\, c2\, d2\, D2\, e^{i\,t}\, t - \frac{1}{2} i\, C1\, d1^2\, e^{i\,t}\, G\, t - \frac{1}{2} C2\, d1^2\, e^{i\,t}\, G\, t + \\
& C1\, d1\, d2\, e^{i\,t}\, G\, t - i\, C2\, d1\, d2\, e^{i\,t}\, G\, t + \frac{1}{2} i\, C1\, d2^2\, e^{i\,t}\, G\, t + \frac{1}{2} C2\, d2^2\, e^{i\,t}\, G\, t
\end{aligned}
$$

In[•]:=
```
z33full /.
  {c1 → 1 , c2 → -I, C1 → 1, C2 → I, d1 → c, D1 → k, d2 → I * c, D2 → -I * k}
```

Out[•]=
$$a\, e^{i t} + \left(\frac{1}{2} + \frac{i}{2}\right) a\, c\, k + \left(\frac{3}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k - 4\, i\, a\, e^{i t}\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, k\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k\, t$$

In[•]:=
```
Simplify[
  a e^(I t) + (1/2 + I/2) a c k + (3/2 - I/2) a c e^(I t) k - 4 I a e^(I t) t + (1/2 - I/2) a c k t + (1/2 - I/2) a c e^(I t) k t]
```

Out[•]=
$$\left(\frac{1}{2} + \frac{i}{2}\right) a \left(c\, k \left(1 - i\, t\right) - i\, e^{i t} \left(\left(1 + i\right) + \left(4 - 4\, i\right) t + c\, k \left(\left(2 + i\right) + t\right)\right)\right)$$

In[•]:=
```
Expand[(1/2 + I/2) a (c k (1 - I t) - I e^(I t) ((1 + I) + (4 - 4 I) t + c k ((2 + I) + t)))]
```

Out[•]=
$$a\, e^{i t} + \left(\frac{1}{2} + \frac{i}{2}\right) a\, c\, k + \left(\frac{3}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k - 4\, i\, a\, e^{i t}\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, k\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k\, t$$

In[•]:=
```
ClearAll[z33full]
```

In[•]:=
```
z23full :=
  a e^(I t) + (1/2 + I/2) a c k + (3/2 - I/2) a c e^(I t) k - 4 I a e^(I t) t + (1/2 - I/2) a c k t + (1/2 - I/2) a c e^(I t) k t
```

In[•]:=
```
z23full
```

Out[•]=
$$a\, e^{i t} + \left(\frac{1}{2} + \frac{i}{2}\right) a\, c\, k + \left(\frac{3}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k - 4\, i\, a\, e^{i t}\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, k\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k\, t$$

In[•]:=
```
Simplify[
  a e^(I t) + (1/2 + I/2) a c k + (3/2 - I/2) a c e^(I t) k - 4 I a e^(I t) t + (1/2 - I/2) a c k t + (1/2 - I/2) a c e^(I t) k t]
```

Out[•]=
$$\left(\frac{1}{2} + \frac{i}{2}\right) a \left(c\, k \left(1 - i\, t\right) - i\, e^{i t} \left(\left(1 + i\right) + \left(4 - 4\, i\right) t + c\, k \left(\left(2 + i\right) + t\right)\right)\right)$$

In[•]:=
```
Expand[(1/2 + I/2) a (c k (1 - I t) - I e^(I t) ((1 + I) + (4 - 4 I) t + c k ((2 + I) + t)))]
```

Out[•]=
$$a\, e^{i t} + \left(\frac{1}{2} + \frac{i}{2}\right) a\, c\, k + \left(\frac{3}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k - 4\, i\, a\, e^{i t}\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, k\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, e^{i t}\, k\, t$$

In[•]:=
```
Collect[%, Exp[I * t]]
```

Out[•]=
$$\left(\frac{1}{2} + \frac{i}{2}\right) a\, c\, k + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, k\, t + e^{i t} \left(a + \left(\frac{3}{2} - \frac{i}{2}\right) a\, c\, k - 4\, i\, a\, t + \left(\frac{1}{2} - \frac{i}{2}\right) a\, c\, k\, t\right)$$

In[•]:=
$$p_0\,p_1 - i\,p_1\left(i\,p_0 + \frac{1}{4}\,i\,p_1\left(-z_2\,Z_2 - z_3\,Z_3\right) + \frac{1}{4}\,p_3\left(B\,z_2\,Z_2^2 + 2\,G\,z_3\,Z_2^2 - Z_3 - 4\,a\,z_2\,Z_2\,Z_3 - 2\,B\,z_3\,Z_2\,Z_3 - b\,z_2\,Z_3^2 + 2\,a\,z_3\,Z_3^2\right) + \frac{1}{4}\,p_2\left(-Z_2 + 2\,a\,z_2\,Z_2^2 + B\,z_3\,Z_2^2 + 2\,b\,z_2\,Z_2\,Z_3 - 4\,a\,z_3\,Z_2\,Z_3 + 2\,g\,z_2\,Z_3^2 - b\,z_3\,Z_3^2\right)\right) + P_3\left(\frac{1}{4}\,i\,p_1\left(-z_3 + b\,z_2^2\,Z_2 - 4\,a\,z_2\,z_3\,Z_2 - B\,z_3^2\,Z_2 + 2\,g\,z_2^2\,Z_3 - 2\,b\,z_2\,z_3\,Z_3 + 2\,a\,z_3^2\,Z_3\right) + \frac{1}{4}\,p_3\left(-1 - 2\,B\,z_3\,Z_2 - 2\,b\,z_2\,Z_3 - a\left(4\,z_2\,Z_2 - 4\,z_3\,Z_3\right)\right) + \frac{1}{4}\,p_2\left(b\,z_2\,Z_2 - 4\,a\,z_3\,Z_2 + 4\,g\,z_2\,Z_3 - b\,z_3\,Z_3 + b\left(z_2\,Z_2 - z_3\,Z_3\right)\right)\right) + P_2\left(\frac{1}{4}\,i\,p_1\left(-z_2 + 2\,a\,z_2^2\,Z_2 + 2\,B\,z_2\,z_3\,Z_2 + 2\,G\,z_3^2\,Z_2 + b\,z_2^2\,Z_3 - 4\,a\,z_2\,z_3\,Z_3 - B\,z_3^2\,Z_3\right) + \frac{1}{4}\,p_3\left(B\,z_2\,Z_2 + 4\,G\,z_3\,Z_2 - 4\,a\,z_2\,Z_3 - B\,z_3\,Z_3 + B\left(z_2\,Z_2 - z_3\,Z_3\right)\right) + \frac{1}{4}\,p_2\left(-1 + 2\,B\,z_3\,Z_2 + 2\,b\,z_2\,Z_3 - a\left(-4\,z_2\,Z_2 + 4\,z_3\,Z_3\right)\right)\right)$$

Out[•]=
$$p_0\,p_1 - i\,p_1\left(i\,p_0 + \frac{1}{4}\,i\,p_1\left(-z_2\,Z_2 - z_3\,Z_3\right) + \frac{1}{4}\,p_3\left(B\,z_2\,Z_2^2 + 2\,G\,z_3\,Z_2^2 - Z_3 - 4\,a\,z_2\,Z_2\,Z_3 - 2\,B\,z_3\,Z_2\,Z_3 - b\,z_2\,Z_3^2 + 2\,a\,z_3\,Z_3^2\right) + \frac{1}{4}\,p_2\left(-Z_2 + 2\,a\,z_2\,Z_2^2 + B\,z_3\,Z_2^2 + 2\,b\,z_2\,Z_2\,Z_3 - 4\,a\,z_3\,Z_2\,Z_3 + 2\,g\,z_2\,Z_3^2 - b\,z_3\,Z_3^2\right)\right) + P_3\left(\frac{1}{4}\,i\,p_1\left(-z_3 + b\,z_2^2\,Z_2 - 4\,a\,z_2\,z_3\,Z_2 - B\,z_3^2\,Z_2 + 2\,g\,z_2^2\,Z_3 - 2\,b\,z_2\,z_3\,Z_3 + 2\,a\,z_3^2\,Z_3\right) + \frac{1}{4}\,p_3\left(-1 - 2\,B\,z_3\,Z_2 - 2\,b\,z_2\,Z_3 - a\left(4\,z_2\,Z_2 - 4\,z_3\,Z_3\right)\right) + \frac{1}{4}\,p_2\left(b\,z_2\,Z_2 - 4\,a\,z_3\,Z_2 + 4\,g\,z_2\,Z_3 - b\,z_3\,Z_3 + b\left(z_2\,Z_2 - z_3\,Z_3\right)\right)\right) + P_2\left(\frac{1}{4}\,i\,p_1\left(-z_2 + 2\,a\,z_2^2\,Z_2 + 2\,B\,z_2\,z_3\,Z_2 + 2\,G\,z_3^2\,Z_2 + b\,z_2^2\,Z_3 - 4\,a\,z_2\,z_3\,Z_3 - B\,z_3^2\,Z_3\right) + \frac{1}{4}\,p_3\left(B\,z_2\,Z_2 + 4\,G\,z_3\,Z_2 - 4\,a\,z_2\,Z_3 - B\,z_3\,Z_3 + B\left(z_2\,Z_2 - z_3\,Z_3\right)\right) + \frac{1}{4}\,p_2\left(-1 + 2\,B\,z_3\,Z_2 + 2\,b\,z_2\,Z_3 - a\left(-4\,z_2\,Z_2 + 4\,z_3\,Z_3\right)\right)\right)$$

In[•]:= **Expand[%114]**

Out[•]=
$$2\,p_0\,p_1 - \frac{p_2\,P_2}{4} - \frac{p_3\,P_3}{4} - \frac{1}{4}\,i\,p_1\,P_2\,z_2 - \frac{1}{4}\,i\,p_1\,P_3\,z_3 + \frac{1}{4}\,i\,p_1\,p_2\,Z_2 - \frac{1}{4}\,p_1^2\,z_2\,Z_2 + a\,p_2\,P_2\,z_2\,Z_2 +$$
$$\frac{1}{2}\,B\,p_3\,P_2\,z_2\,Z_2 + \frac{1}{2}\,b\,p_2\,P_3\,z_2\,Z_2 - a\,p_3\,P_3\,z_2\,Z_2 + \frac{1}{2}\,i\,a\,p_1\,P_2\,z_2^2\,Z_2 + \frac{1}{4}\,i\,b\,p_1\,P_3\,z_2^2\,Z_2 +$$
$$\frac{1}{2}\,B\,p_2\,P_2\,z_3\,Z_2 + G\,p_3\,P_2\,z_3\,Z_2 - a\,p_2\,P_3\,z_3\,Z_2 - \frac{1}{2}\,B\,p_3\,P_3\,z_3\,Z_2 + \frac{1}{2}\,i\,B\,p_1\,P_2\,z_2\,z_3\,Z_2 -$$
$$i\,a\,p_1\,P_3\,z_2\,z_3\,Z_2 + \frac{1}{2}\,i\,G\,p_1\,P_2\,z_3^2\,Z_2 - \frac{1}{4}\,i\,B\,p_1\,P_3\,z_3^2\,Z_2 - \frac{1}{2}\,i\,a\,p_1\,p_2\,z_2\,Z_2^2 - \frac{1}{4}\,i\,B\,p_1\,p_3\,z_2\,Z_2^2 -$$
$$\frac{1}{4}\,i\,B\,p_1\,p_2\,z_3\,Z_2^2 - \frac{1}{2}\,i\,G\,p_1\,p_3\,z_3\,Z_2^2 + \frac{1}{4}\,i\,p_1\,p_3\,Z_3 + \frac{1}{2}\,b\,p_2\,P_2\,z_2\,Z_3 - a\,p_3\,P_2\,z_2\,Z_3 +$$
$$g\,p_2\,P_3\,z_2\,Z_3 - \frac{1}{2}\,b\,p_3\,P_3\,z_2\,Z_3 + \frac{1}{4}\,i\,b\,p_1\,P_2\,z_2^2\,Z_3 + \frac{1}{2}\,i\,g\,p_1\,P_3\,z_2^2\,Z_3 - \frac{1}{4}\,p_1^2\,z_3\,Z_3 - a\,p_2\,P_2\,z_3\,Z_3 -$$
$$\frac{1}{2}\,B\,p_3\,P_2\,z_3\,Z_3 - \frac{1}{2}\,b\,p_2\,P_3\,z_3\,Z_3 + a\,p_3\,P_3\,z_3\,Z_3 - i\,a\,p_1\,P_2\,z_2\,z_3\,Z_3 - \frac{1}{2}\,i\,b\,p_1\,P_3\,z_2\,z_3\,Z_3 -$$
$$\frac{1}{4}\,i\,B\,p_1\,P_2\,z_3^2\,Z_3 + \frac{1}{2}\,i\,a\,p_1\,P_3\,z_3^2\,Z_3 - \frac{1}{2}\,i\,b\,p_1\,p_2\,z_2\,Z_2\,Z_3 + i\,a\,p_1\,p_3\,z_2\,Z_2\,Z_3 + i\,a\,p_1\,p_2\,z_3\,Z_2\,Z_3 +$$
$$\frac{1}{2}\,i\,B\,p_1\,p_3\,z_3\,Z_2\,Z_3 - \frac{1}{2}\,i\,g\,p_1\,p_2\,z_2\,Z_3^2 + \frac{1}{4}\,i\,b\,p_1\,p_3\,z_2\,Z_3^2 + \frac{1}{4}\,i\,b\,p_1\,p_2\,z_3\,Z_3^2 - \frac{1}{2}\,i\,a\,p_1\,p_3\,z_3\,Z_3^2$$

In[•]:= **b := 0**

In[•]:= **B := 0**

In[•]:=
$$2\,p_0\,p_1 - \frac{p_2\,P_2}{4} - \frac{p_3\,P_3}{4} - \frac{1}{4}\,i\,p_1\,P_2\,z_2 - \frac{1}{4}\,i\,p_1\,P_3\,z_3 + \frac{1}{4}\,i\,p_1\,p_2\,Z_2 - \frac{1}{4}\,p_1^2\,z_2\,Z_2 + a\,p_2\,P_2\,z_2\,Z_2 + \frac{1}{2}\,B\,p_3\,P_2\,z_2\,Z_2 + \frac{1}{2}\,b\,p_2\,P_3\,z_2\,Z_2 - a\,p_3\,P_3\,z_2\,Z_2 + \frac{1}{2}\,i\,a\,p_1\,P_2\,z_2^2\,Z_2 + \frac{1}{4}\,i\,b\,p_1\,P_3\,z_2^2\,Z_2 + \frac{1}{2}\,B\,p_2\,P_2\,z_3\,Z_2 + G\,p_3\,P_2\,z_3\,Z_2 - a\,p_2\,P_3\,z_3\,Z_2 - \frac{1}{2}\,B\,p_3\,P_3\,z_3\,Z_2 + \frac{1}{2}\,i\,B\,p_1\,P_2\,z_2\,z_3\,Z_2 - i\,a\,p_1\,P_3\,z_2\,z_3\,Z_2 + \frac{1}{2}\,i\,G\,p_1\,P_2\,z_3^2\,Z_2 - \frac{1}{4}\,i\,B\,p_1\,P_3\,z_3^2\,Z_2 - \frac{1}{2}\,i\,a\,p_1\,p_2\,z_2\,Z_2^2 - \frac{1}{4}\,i\,B\,p_1\,p_3\,z_2\,Z_2^2 - \frac{1}{4}\,i\,B\,p_1\,p_2\,z_3\,Z_2^2 - \frac{1}{2}\,i\,G\,p_1\,p_3\,z_3\,Z_2^2 + \frac{1}{4}\,i\,p_1\,p_3\,Z_3 + \frac{1}{2}\,b\,p_2\,P_2\,z_2\,Z_3 - a\,p_3\,P_2\,z_2\,Z_3 + g\,p_2\,P_3\,z_2\,Z_3 - \frac{1}{2}\,b\,p_3\,P_3\,z_2\,Z_3 + \frac{1}{4}\,i\,b\,p_1\,P_2\,z_2^2\,Z_3 + \frac{1}{2}\,i\,g\,p_1\,P_3\,z_2^2\,Z_3 - \frac{1}{4}\,p_1^2\,z_3\,Z_3 - a\,p_2\,P_2\,z_3\,Z_3 - \frac{1}{2}\,B\,p_3\,P_2\,z_3\,Z_3 - \frac{1}{2}\,b\,p_2\,P_3\,z_3\,Z_3 + a\,p_3\,P_3\,z_3\,Z_3 - i\,a\,p_1\,P_2\,z_2\,z_3\,Z_3 - \frac{1}{2}\,i\,b\,p_1\,P_3\,z_2\,z_3\,Z_3 - \frac{1}{4}\,i\,B\,p_1\,P_2\,z_3^2\,Z_3 + \frac{1}{2}\,i\,a\,p_1\,P_3\,z_3^2\,Z_3 - \frac{1}{2}\,i\,b\,p_1\,p_2\,z_2\,Z_2\,Z_3 + i\,a\,p_1\,p_3\,z_2\,Z_2\,Z_3 + i\,a\,p_1\,p_2\,z_3\,Z_2\,Z_3 + \frac{1}{2}\,i\,B\,p_1\,p_3\,z_3\,Z_2\,Z_3 - \frac{1}{2}\,i\,g\,p_1\,p_2\,z_2\,Z_3^2 + \frac{1}{4}\,i\,b\,p_1\,p_3\,z_2\,Z_3^2 + \frac{1}{4}\,i\,b\,p_1\,p_2\,z_3\,Z_3^2 - \frac{1}{2}\,i\,a\,p_1\,p_3\,z_3\,Z_3^2$$

Out[•]=
$$2\,p_0\,p_1 - \frac{p_2\,P_2}{4} - \frac{p_3\,P_3}{4} - \frac{1}{4}\,i\,p_1\,P_2\,z_2 - \frac{1}{4}\,i\,p_1\,P_3\,z_3 + \frac{1}{4}\,i\,p_1\,p_2\,Z_2 - \frac{1}{4}\,p_1^2\,z_2\,Z_2 + a\,p_2\,P_2\,z_2\,Z_2 - a\,p_3\,P_3\,z_2\,Z_2 + \frac{1}{2}\,i\,a\,p_1\,P_2\,z_2^2\,Z_2 + G\,p_3\,P_2\,z_3\,Z_2 - a\,p_2\,P_3\,z_3\,Z_2 - i\,a\,p_1\,P_3\,z_2\,z_3\,Z_2 + \frac{1}{2}\,i\,G\,p_1\,P_2\,z_3^2\,Z_2 - \frac{1}{2}\,i\,a\,p_1\,p_2\,z_2\,Z_2^2 - \frac{1}{2}\,i\,G\,p_1\,p_3\,z_3\,Z_2^2 + \frac{1}{4}\,i\,p_1\,p_3\,Z_3 - a\,p_3\,P_2\,z_2\,Z_3 + g\,p_2\,P_3\,z_2\,Z_3 + \frac{1}{2}\,i\,g\,p_1\,P_3\,z_2^2\,Z_3 - \frac{1}{4}\,p_1^2\,z_3\,Z_3 - a\,p_2\,P_2\,z_3\,Z_3 + a\,p_3\,P_3\,z_3\,Z_3 - i\,a\,p_1\,P_2\,z_2\,z_3\,Z_3 + \frac{1}{2}\,i\,a\,p_1\,P_3\,z_3^2\,Z_3 + i\,a\,p_1\,p_3\,z_2\,Z_2\,Z_3 + i\,a\,p_1\,p_2\,z_3\,Z_2\,Z_3 - \frac{1}{2}\,i\,g\,p_1\,p_2\,z_2\,Z_3^2 - \frac{1}{2}\,i\,a\,p_1\,p_3\,z_3\,Z_3^2$$