In[•]:=
```
dSdteqn[a_] =
 - β S[0, a] × II[0, a] - μS S[0, a] - (D[S[t, a], t] /. t → 0) - D[S[0, a], a]
dEEdteqn[a_] = (1 - ϵ) β S[0, a] × II[0, a] - δ EE[0, a] -
  μE EE[0, a] - (D[EE[t, a], t] /. t → 0) - D[EE[0, a], a]
dIIdteqn[a_] = ϵ β S[0, a] × II[0, a] + δ EE[0, a] -
  μI II[0, a] - (D[II[t, a], t] /. t → 0) - D[II[0, a], a]
```

Out[•]= $-\mu S\, S[0, a] - \beta\, II[0, a] \times S[0, a] - S^{(0,1)}[0, a] - S^{(1,0)}[0, a]$

Out[•]= $-\delta\, EE[0, a] - \mu E\, EE[0, a] + \beta\, (1 - \epsilon)\, II[0, a] \times S[0, a] - EE^{(0,1)}[0, a] - EE^{(1,0)}[0, a]$

Out[•]= $\delta\, EE[0, a] - \mu I\, II[0, a] + \beta\, \epsilon\, II[0, a] \times S[0, a] - II^{(0,1)}[0, a] - II^{(1,0)}[0, a]$

In[•]:=
```
yEeqn[t_, a_] = kE EE[t, a] - yE[t, a]
yIeqn[t_, a_] = kI (ϵ β S[t, a] × II[t, a] + δ EE[t, a]) - yI[t, a]
Seqn[t_, a_] = S[t, a] + EE[t, a] + II[t, a] - Ntot[t, a]
```

Out[•]= $kE\, EE[t, a] - yE[t, a]$

Out[•]= $kI\, (\delta\, EE[t, a] + \beta\, \epsilon\, II[t, a] \times S[t, a]) - yI[t, a]$

Out[•]= $EE[t, a] + II[t, a] - Ntot[t, a] + S[t, a]$

In[•]:=
```
yEmap[t_, a_] = Solve[yEeqn[t, a] == 0, EE[t, a]][[1]]
Smap[t_, a_] = Solve[Seqn[t, a] == 0, S[t, a]][[1]]
yImap[t_, a_] = Solve[(yIeqn[t, a] /. Smap[t, a] /. yEmap[t, a]) == 0, II[t, a]][[1]]
```

Out[•]= $\left\{EE[t, a] \to \frac{yE[t, a]}{kE}\right\}$

Out[•]= $\{S[t, a] \to -EE[t, a] - II[t, a] + Ntot[t, a]\}$

Out[•]= $$\left\{II[t, a] \to \frac{1}{2\, kI\, \beta\, \epsilon}\left(kI\, \beta\, \epsilon\, Ntot[t, a] - \frac{kI\, \beta\, \epsilon\, yE[t, a]}{kE} - \sqrt{\left(kI\, \beta\, \epsilon\, Ntot[t, a] - \frac{kI\, \beta\, \epsilon\, yE[t, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon\left(\frac{kI\, \delta\, yE[t, a]}{kE} - yI[t, a]\right)}\right)\right\}$$

In[•]:=
```
dSdteqn2[a_] = dSdteqn[a] /. (Smap[t, a] /. t → 0) /. (D[Smap[t, a], t] /. t → 0) /.
      (D[Smap[t, a], a] /. t → 0) /. (yEmap[t, a] /. t → 0) /.
    (D[yEmap[t, a], t] /. t → 0) /. (D[yEmap[t, a], a] /. t → 0)
dEEdteqn2[a_] = dEEdteqn[a] /. (Smap[t, a] /. t → 0) /. (D[Smap[t, a], t] /. t → 0) /.
      (D[Smap[t, a], a] /. t → 0) /. (yEmap[t, a] /. t → 0) /.
    (D[yEmap[t, a], t] /. t → 0) /. (D[yEmap[t, a], a] /. t → 0)
dIIdteqn2[a_] = dIIdteqn[a] /. (Smap[t, a] /. t → 0) /. (D[Smap[t, a], t] /. t → 0) /.
      (D[Smap[t, a], a] /. t → 0) /. (yEmap[t, a] /. t → 0) /.
    (D[yEmap[t, a], t] /. t → 0) /. (D[yEmap[t, a], a] /. t → 0)
```

Out[•]=
$$-\mu S\left(-II[0,a]+Ntot[0,a]-\frac{yE[0,a]}{kE}\right)-\beta\, II[0,a]\left(-II[0,a]+Ntot[0,a]-\frac{yE[0,a]}{kE}\right)+ II^{(0,1)}[0,a]-Ntot^{(0,1)}[0,a]+\frac{yE^{(0,1)}[0,a]}{kE}+II^{(1,0)}[0,a]-Ntot^{(1,0)}[0,a]+\frac{yE^{(1,0)}[0,a]}{kE}$$

Out[•]=
$$-\frac{\delta\, yE[0,a]}{kE}-\frac{\mu E\, yE[0,a]}{kE}+ \beta\,(1-\epsilon)\, II[0,a]\left(-II[0,a]+Ntot[0,a]-\frac{yE[0,a]}{kE}\right)-\frac{yE^{(0,1)}[0,a]}{kE}-\frac{yE^{(1,0)}[0,a]}{kE}$$

Out[•]=
$$-\mu I\, II[0,a]+\frac{\delta\, yE[0,a]}{kE}+ \beta\,\epsilon\, II[0,a]\left(-II[0,a]+Ntot[0,a]-\frac{yE[0,a]}{kE}\right)-II^{(0,1)}[0,a]-II^{(1,0)}[0,a]$$

In[•]:=
```
yI2map[t_, a_] = {II[t, a] → (p1[t, a] - √p2[t, a]) / p3[t, a]}
```

Out[•]=
$$\left\{II[t,a]\to\frac{p1[t,a]-\sqrt{p2[t,a]}}{p3[t,a]}\right\}$$

In[•]:=
```
dSdteqn3[a_] = dSdteqn2[a] /. (yI2map[t, a] /. t → 0) /. (D[yI2map[t, a], t] /. t → 0) /.
  (D[yI2map[t, a], a] /. t → 0)
dEEdteqn3[a_] = dEEdteqn2[a] /. (yI2map[t, a] /. t → 0) /.
   (D[yI2map[t, a], t] /. t → 0) /. (D[yI2map[t, a], a] /. t → 0)
dIIdteqn3[a_] = dIIdteqn2[a] /. (yI2map[t, a] /. t → 0) /.
   (D[yI2map[t, a], t] /. t → 0) /. (D[yI2map[t, a], a] /. t → 0)
```

Out[•]=
$$-\mu S\left(\text{Ntot}[0,a]-\frac{\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}}{\text{p3}[0,a]}-\frac{\text{yE}[0,a]}{\text{kE}}\right)-\frac{\beta\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\left(\text{Ntot}[0,a]-\frac{\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}}{\text{p3}[0,a]}-\frac{\text{yE}[0,a]}{\text{kE}}\right)}{\text{p3}[0,a]}-\text{Ntot}^{(0,1)}[0,a]+\frac{\text{p1}^{(0,1)}[0,a]-\frac{\text{p2}^{(0,1)}[0,a]}{2\sqrt{\text{p2}[0,a]}}}{\text{p3}[0,a]}-\frac{\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\text{p3}^{(0,1)}[0,a]}{\text{p3}[0,a]^2}+\frac{\text{yE}^{(0,1)}[0,a]}{\text{kE}}-\text{Ntot}^{(1,0)}[0,a]+\frac{\text{p1}^{(1,0)}[0,a]-\frac{\text{p2}^{(1,0)}[0,a]}{2\sqrt{\text{p2}[0,a]}}}{\text{p3}[0,a]}-\frac{\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\text{p3}^{(1,0)}[0,a]}{\text{p3}[0,a]^2}+\frac{\text{yE}^{(1,0)}[0,a]}{\text{kE}}$$

Out[•]=
$$-\frac{\delta\,\text{yE}[0,a]}{\text{kE}}-\frac{\mu\text{E}\,\text{yE}[0,a]}{\text{kE}}+\frac{\beta(1-\epsilon)\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\left(\text{Ntot}[0,a]-\frac{\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}}{\text{p3}[0,a]}-\frac{\text{yE}[0,a]}{\text{kE}}\right)}{\text{p3}[0,a]}-\frac{\text{yE}^{(0,1)}[0,a]}{\text{kE}}-\frac{\text{yE}^{(1,0)}[0,a]}{\text{kE}}$$

Out[•]=
$$-\frac{\mu\text{I}\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)}{\text{p3}[0,a]}+\frac{\delta\,\text{yE}[0,a]}{\text{kE}}+\frac{\beta\epsilon\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\left(\text{Ntot}[0,a]-\frac{\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}}{\text{p3}[0,a]}-\frac{\text{yE}[0,a]}{\text{kE}}\right)}{\text{p3}[0,a]}-\frac{\text{p1}^{(0,1)}[0,a]-\frac{\text{p2}^{(0,1)}[0,a]}{2\sqrt{\text{p2}[0,a]}}}{\text{p3}[0,a]}+\frac{\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\text{p3}^{(0,1)}[0,a]}{\text{p3}[0,a]^2}-\frac{\text{p1}^{(1,0)}[0,a]-\frac{\text{p2}^{(1,0)}[0,a]}{2\sqrt{\text{p2}[0,a]}}}{\text{p3}[0,a]}+\frac{\left(\text{p1}[0,a]-\sqrt{\text{p2}[0,a]}\right)\text{p3}^{(1,0)}[0,a]}{\text{p3}[0,a]^2}$$

In[∘]:=
```
Together[dSdteqn3[a]] × Denominator[Together[dSdteqn3[a]]]
```

Out[∘]=
$$2\,kE\,\beta\,p1[0,a]^2\sqrt{p2[0,a]} - 4\,kE\,\beta\,p1[0,a]\times p2[0,a] + 2\,kE\,\beta\,p2[0,a]^{3/2} + 2\,kE\,\mu S\,p1[0,a]\sqrt{p2[0,a]}\,p3[0,a] - 2\,kE\,\beta\,Ntot[0,a]\times p1[0,a]\sqrt{p2[0,a]}\,p3[0,a] - 2\,kE\,\mu S\,p2[0,a]\times p3[0,a] + 2\,kE\,\beta\,Ntot[0,a]\times p2[0,a]\times p3[0,a] - 2\,kE\,\mu S\,Ntot[0,a]\sqrt{p2[0,a]}\,p3[0,a]^2 + 2\,\beta\,p1[0,a]\sqrt{p2[0,a]}\,p3[0,a]\times yE[0,a] - 2\,\beta\,p2[0,a]\times p3[0,a]\times yE[0,a] + 2\,\mu S\sqrt{p2[0,a]}\,p3[0,a]^2\,yE[0,a] - 2\,kE\sqrt{p2[0,a]}\,p3[0,a]^2\,Ntot^{(0,1)}[0,a] + 2\,kE\sqrt{p2[0,a]}\,p3[0,a]\,p1^{(0,1)}[0,a] - kE\,p3[0,a]\,p2^{(0,1)}[0,a] - 2\,kE\,p1[0,a]\sqrt{p2[0,a]}\,p3^{(0,1)}[0,a] + 2\,kE\,p2[0,a]\,p3^{(0,1)}[0,a] + 2\sqrt{p2[0,a]}\,p3[0,a]^2\,yE^{(0,1)}[0,a] - 2\,kE\sqrt{p2[0,a]}\,p3[0,a]^2\,Ntot^{(1,0)}[0,a] + 2\,kE\sqrt{p2[0,a]}\,p3[0,a]\,p1^{(1,0)}[0,a] - kE\,p3[0,a]\,p2^{(1,0)}[0,a] - 2\,kE\,p1[0,a]\sqrt{p2[0,a]}\,p3^{(1,0)}[0,a] + 2\,kE\,p2[0,a]\,p3^{(1,0)}[0,a] + 2\sqrt{p2[0,a]}\,p3[0,a]^2\,yE^{(1,0)}[0,a]$$

In[∘]:=
```
s2thing[a_] =
 Collect[Together[dSdteqn3[a]] × Denominator[Together[dSdteqn3[a]]], √p2[0, a]]
EE2thing[a_] = Collect[Together[dEEdteqn3[a]] ×
   Denominator[Together[dEEdteqn3[a]]], √p2[0, a]]
II2thing[a_] = Collect[Together[dIIdteqn3[a]] ×
   Denominator[Together[dIIdteqn3[a]]], √p2[0, a]]
```

Out[∘]=
$$2\,kE\,\beta\,p2[0,a]^{3/2} - kE\,p3[0,a]\,p2^{(0,1)}[0,a] - kE\,p3[0,a]\,p2^{(1,0)}[0,a] + p2[0,a]\left(-4\,kE\,\beta\,p1[0,a] - 2\,kE\,\mu S\,p3[0,a] + 2\,kE\,\beta\,Ntot[0,a]\times p3[0,a] - 2\,\beta\,p3[0,a]\times yE[0,a] + 2\,kE\,p3^{(0,1)}[0,a] + 2\,kE\,p3^{(1,0)}[0,a]\right) + \sqrt{p2[0,a]}\left(2\,kE\,\beta\,p1[0,a]^2 + 2\,kE\,\mu S\,p1[0,a]\times p3[0,a] - 2\,kE\,\beta\,Ntot[0,a]\times p1[0,a]\times p3[0,a] - 2\,kE\,\mu S\,Ntot[0,a]\,p3[0,a]^2 + 2\,\beta\,p1[0,a]\times p3[0,a]\times yE[0,a] + 2\,\mu S\,p3[0,a]^2\,yE[0,a] - 2\,kE\,p3[0,a]^2\,Ntot^{(0,1)}[0,a] + 2\,kE\,p3[0,a]\,p1^{(0,1)}[0,a] - 2\,kE\,p1[0,a]\,p3^{(0,1)}[0,a] + 2\,p3[0,a]^2\,yE^{(0,1)}[0,a] - 2\,kE\,p3[0,a]^2\,Ntot^{(1,0)}[0,a] + 2\,kE\,p3[0,a]\,p1^{(1,0)}[0,a] - 2\,kE\,p1[0,a]\,p3^{(1,0)}[0,a] + 2\,p3[0,a]^2\,yE^{(1,0)}[0,a]\right)$$

Out[∘]=
$$-kE\,\beta\,p1[0,a]^2 + kE\,\beta\,\epsilon\,p1[0,a]^2 + (-kE\,\beta + kE\,\beta\,\epsilon)\,p2[0,a] + kE\,\beta\,Ntot[0,a]\times p1[0,a]\times p3[0,a] - kE\,\beta\,\epsilon\,Ntot[0,a]\times p1[0,a]\times p3[0,a] - \beta\,p1[0,a]\times p3[0,a]\times yE[0,a] + \beta\,\epsilon\,p1[0,a]\times p3[0,a]\times yE[0,a] - \delta\,p3[0,a]^2\,yE[0,a] - \mu E\,p3[0,a]^2\,yE[0,a] + \sqrt{p2[0,a]}\,(2\,kE\,\beta\,p1[0,a] - 2\,kE\,\beta\,\epsilon\,p1[0,a] - kE\,\beta\,Ntot[0,a]\times p3[0,a] + kE\,\beta\,\epsilon\,Ntot[0,a]\times p3[0,a] + \beta\,p3[0,a]\times yE[0,a] - \beta\,\epsilon\,p3[0,a]\times yE[0,a]) - p3[0,a]^2\,yE^{(0,1)}[0,a] - p3[0,a]^2\,yE^{(1,0)}[0,a]$$

Out[∘]=
$$-2\,kE\,\beta\,\epsilon\,p2[0,a]^{3/2} + kE\,p3[0,a]\,p2^{(0,1)}[0,a] + kE\,p3[0,a]\,p2^{(1,0)}[0,a] + p2[0,a]\left(4\,kE\,\beta\,\epsilon\,p1[0,a] + 2\,kE\,\mu I\,p3[0,a] - 2\,kE\,\beta\,\epsilon\,Ntot[0,a]\times p3[0,a] + 2\,\beta\,\epsilon\,p3[0,a]\times yE[0,a] - 2\,kE\,p3^{(0,1)}[0,a] - 2\,kE\,p3^{(1,0)}[0,a]\right) + \sqrt{p2[0,a]}\left(-2\,kE\,\beta\,\epsilon\,p1[0,a]^2 - 2\,kE\,\mu I\,p1[0,a]\times p3[0,a] + 2\,kE\,\beta\,\epsilon\,Ntot[0,a]\times p1[0,a]\times p3[0,a] - 2\,\beta\,\epsilon\,p1[0,a]\times p3[0,a]\times yE[0,a] + 2\,\delta\,p3[0,a]^2\,yE[0,a] - 2\,kE\,p3[0,a]\,p1^{(0,1)}[0,a] + 2\,kE\,p1[0,a]\,p3^{(0,1)}[0,a] - 2\,kE\,p3[0,a]\,p1^{(1,0)}[0,a] + 2\,kE\,p1[0,a]\,p3^{(1,0)}[0,a]\right)$$

In[•]:=
```
spart2[a_] =
 Coefficient[s2thing[a], Sqrt[p2[0, a]]] + p2[0, a] × Coefficient[s2thing[a], p2[0, a]^(3/2)]
EEpart2[a_] = Coefficient[EE2thing[a], Sqrt[p2[0, a]]] +
  p2[0, a] × Coefficient[EE2thing[a], p2[0, a]^(3/2)]
IIpart2[a_] = Coefficient[II2thing[a], Sqrt[p2[0, a]]] +
  p2[0, a] × Coefficient[II2thing[a], p2[0, a]^(3/2)]
```

Out[•]=
```
2 kE β p1[0, a]^2 + 2 kE β p2[0, a] + 2 kE μS p1[0, a] × p3[0, a] -
 2 kE β Ntot[0, a] × p1[0, a] × p3[0, a] - 2 kE μS Ntot[0, a] p3[0, a]^2 +
 2 β p1[0, a] × p3[0, a] × yE[0, a] + 2 μS p3[0, a]^2 yE[0, a] -
 2 kE p3[0, a]^2 Ntot^(0,1)[0, a] + 2 kE p3[0, a] p1^(0,1)[0, a] -
 2 kE p1[0, a] p3^(0,1)[0, a] + 2 p3[0, a]^2 yE^(0,1)[0, a] - 2 kE p3[0, a]^2 Ntot^(1,0)[0, a] +
 2 kE p3[0, a] p1^(1,0)[0, a] - 2 kE p1[0, a] p3^(1,0)[0, a] + 2 p3[0, a]^2 yE^(1,0)[0, a]
```

Out[•]=
```
2 kE β p1[0, a] - 2 kE β ϵ p1[0, a] - kE β Ntot[0, a] × p3[0, a] +
 kE β ϵ Ntot[0, a] × p3[0, a] + β p3[0, a] × yE[0, a] - β ϵ p3[0, a] × yE[0, a]
```

Out[•]=
```
-2 kE β ϵ p1[0, a]^2 - 2 kE β ϵ p2[0, a] - 2 kE μI p1[0, a] × p3[0, a] +
 2 kE β ϵ Ntot[0, a] × p1[0, a] × p3[0, a] - 2 β ϵ p1[0, a] × p3[0, a] × yE[0, a] +
 2 δ p3[0, a]^2 yE[0, a] - 2 kE p3[0, a] p1^(0,1)[0, a] + 2 kE p1[0, a] p3^(0,1)[0, a] -
 2 kE p3[0, a] p1^(1,0)[0, a] + 2 kE p1[0, a] p3^(1,0)[0, a]
```

In[•]:=
```
spart1[a_] = Simplify[s2thing[a] - spart2[a] Sqrt[p2[0, a]]]
EEpart1[a_] = Simplify[EE2thing[a] - EEpart2[a] Sqrt[p2[0, a]]]
IIpart1[a_] = Simplify[II2thing[a] - IIpart2[a] Sqrt[p2[0, a]]]
```

Out[•]=
```
-4 kE β p1[0, a] × p2[0, a] - kE p3[0, a] (p2^(0,1)[0, a] + p2^(1,0)[0, a]) + 2 p2[0, a]
  (-p3[0, a] (kE μS - kE β Ntot[0, a] + β yE[0, a]) + kE (p3^(0,1)[0, a] + p3^(1,0)[0, a]))
```

Out[•]=
```
kE β (-1 + ϵ) p1[0, a]^2 + kE β (-1 + ϵ) p2[0, a] -
 β (-1 + ϵ) p1[0, a] × p3[0, a] (kE Ntot[0, a] - yE[0, a]) -
 p3[0, a]^2 ((δ + μE) yE[0, a] + yE^(0,1)[0, a] + yE^(1,0)[0, a])
```

Out[•]=
```
4 kE β ϵ p1[0, a] × p2[0, a] + kE p3[0, a] (p2^(0,1)[0, a] + p2^(1,0)[0, a]) + 2 p2[0, a]
  (p3[0, a] (kE μI - kE β ϵ Ntot[0, a] + β ϵ yE[0, a]) - kE (p3^(0,1)[0, a] + p3^(1,0)[0, a]))
```

In[•]:=
```
s2thing2[a_] = Expand[s2thing[a] (spart1[a] - Sqrt[p2[0, a]] spart2[a])]
EE2thing2[a_] = Expand[EE2thing[a] (EEpart1[a] - Sqrt[p2[0, a]] EEpart2[a])]
II2thing2[a_] = Expand[II2thing[a] (IIpart1[a] - Sqrt[p2[0, a]] IIpart2[a])]
```

Out[•]=
```
-4 kE^2 β^2 p1[0, a]^4 p2[0, a] + 8 kE^2 β^2 p1[0, a]^2 p2[0, a]^2 - 4 kE^2 β^2 p2[0, a]^3 -
 8 kE^2 β μS p1[0, a]^3 p2[0, a] × p3[0, a] + 8 kE^2 β^2 Ntot[0, a] p1[0, a]^3 p2[0, a] × p3[0, a] +
 8 kE^2 β μS p1[0, a] p2[0, a]^2 p3[0, a] - 8 kE^2 β^2 Ntot[0, a] × p1[0, a] p2[0, a]^2 p3[0, a] -
 4 kE^2 μS^2 p1[0, a]^2 p2[0, a] p3[0, a]^2 + 16 kE^2 β μS Ntot[0, a] p1[0, a]^2 p2[0, a] p3[0, a]^2 -
 4 kE^2 β^2 Ntot[0, a]^2 p1[0, a]^2 p2[0, a] p3[0, a]^2 +
```

```
4 kE^2 μS^2 p2[0, a]^2 p3[0, a]^2 + 4 kE^2 β^2 Ntot[0, a]^2 p2[0, a]^2 p3[0, a]^2 +
8 kE^2 μS^2 Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 -
8 kE^2 β μS Ntot[0, a]^2 p1[0, a] × p2[0, a] p3[0, a]^3 -
4 kE^2 μS^2 Ntot[0, a]^2 p2[0, a] p3[0, a]^4 - 8 kE β^2 p1[0, a]^3 p2[0, a] × p3[0, a] × yE[0, a] +
8 kE β^2 p1[0, a] p2[0, a]^2 p3[0, a] × yE[0, a] -
16 kE β μS p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a] +
8 kE β^2 Ntot[0, a] p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a] -
8 kE β^2 Ntot[0, a] p2[0, a]^2 p3[0, a]^2 yE[0, a] -
8 kE μS^2 p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] +
16 kE β μS Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] +
8 kE μS^2 Ntot[0, a] × p2[0, a] p3[0, a]^4 yE[0, a] -
4 β^2 p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a]^2 + 4 β^2 p2[0, a]^2 p3[0, a]^2 yE[0, a]^2 -
8 β μS p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a]^2 - 4 μS^2 p2[0, a] p3[0, a]^4 yE[0, a]^2 +
8 kE^2 β p1[0, a]^2 p2[0, a] p3[0, a]^2 Ntot^(0,1)[0, a] +
8 kE^2 β p2[0, a]^2 p3[0, a]^2 Ntot^(0,1)[0, a] +
8 kE^2 μS p1[0, a] × p2[0, a] p3[0, a]^3 Ntot^(0,1)[0, a] -
8 kE^2 β Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 Ntot^(0,1)[0, a] -
8 kE^2 μS Ntot[0, a] × p2[0, a] p3[0, a]^4 Ntot^(0,1)[0, a] +
8 kE β p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] Ntot^(0,1)[0, a] +
8 kE μS p2[0, a] p3[0, a]^4 yE[0, a] Ntot^(0,1)[0, a] -
4 kE^2 p2[0, a] p3[0, a]^4 Ntot^(0,1)[0, a]^2 -
8 kE^2 β p1[0, a]^2 p2[0, a] × p3[0, a] p1^(0,1)[0, a] - 8 kE^2 β p2[0, a]^2 p3[0, a] p1^(0,1)[0, a] -
8 kE^2 μS p1[0, a] × p2[0, a] p3[0, a]^2 p1^(0,1)[0, a] +
8 kE^2 β Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^2 p1^(0,1)[0, a] +
8 kE^2 μS Ntot[0, a] × p2[0, a] p3[0, a]^3 p1^(0,1)[0, a] -
8 kE β p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p1^(0,1)[0, a] -
8 kE μS p2[0, a] p3[0, a]^3 yE[0, a] p1^(0,1)[0, a] +
8 kE^2 p2[0, a] p3[0, a]^3 Ntot^(0,1)[0, a] p1^(0,1)[0, a] -
4 kE^2 p2[0, a] p3[0, a]^2 p1^(0,1)[0, a]^2 + 8 kE^2 β p1[0, a] × p2[0, a] × p3[0, a] p2^(0,1)[0, a] +
4 kE^2 μS p2[0, a] p3[0, a]^2 p2^(0,1)[0, a] -
4 kE^2 β Ntot[0, a] × p2[0, a] p3[0, a]^2 p2^(0,1)[0, a] +
4 kE β p2[0, a] p3[0, a]^2 yE[0, a] p2^(0,1)[0, a] + kE^2 p3[0, a]^2 p2^(0,1)[0, a]^2 +
8 kE^2 β p1[0, a]^3 p2[0, a] p3^(0,1)[0, a] - 8 kE^2 β p1[0, a] p2[0, a]^2 p3^(0,1)[0, a] +
8 kE^2 μS p1[0, a]^2 p2[0, a] × p3[0, a] p3^(0,1)[0, a] -
8 kE^2 β Ntot[0, a] p1[0, a]^2 p2[0, a] × p3[0, a] p3^(0,1)[0, a] -
8 kE^2 μS p2[0, a]^2 p3[0, a] p3^(0,1)[0, a] +
8 kE^2 β Ntot[0, a] p2[0, a]^2 p3[0, a] p3^(0,1)[0, a] -
8 kE^2 μS Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^2 p3^(0,1)[0, a] +
8 kE β p1[0, a]^2 p2[0, a] × p3[0, a] × yE[0, a] p3^(0,1)[0, a] -
8 kE β p2[0, a]^2 p3[0, a] × yE[0, a] p3^(0,1)[0, a] +
8 kE μS p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p3^(0,1)[0, a] -
8 kE^2 p1[0, a] × p2[0, a] p3[0, a]^2 Ntot^(0,1)[0, a] p3^(0,1)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p1^(0,1)[0, a] p3^(0,1)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p2^(0,1)[0, a] p3^(0,1)[0, a] - 4 kE^2 p1[0, a]^2 p2[0, a] p3^(0,1)[0, a]^2 +
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4 kE^2 p2[0, a]^2 p3^(0,1)[0, a]^2 - 8 kE β p1[0, a]^2 p2[0, a] p3[0, a]^2 yE^(0,1)[0, a] -
8 kE β p2[0, a]^2 p3[0, a]^2 yE^(0,1)[0, a] - 8 kE μS p1[0, a] × p2[0, a] p3[0, a]^3 yE^(0,1)[0, a] +
8 kE β Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 yE^(0,1)[0, a] +
8 kE μS Ntot[0, a] × p2[0, a] p3[0, a]^4 yE^(0,1)[0, a] -
8 β p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] yE^(0,1)[0, a] -
8 μS p2[0, a] p3[0, a]^4 yE[0, a] yE^(0,1)[0, a] +
8 kE p2[0, a] p3[0, a]^4 Ntot^(0,1)[0, a] yE^(0,1)[0, a] -
8 kE p2[0, a] p3[0, a]^3 p1^(0,1)[0, a] yE^(0,1)[0, a] +
8 kE p1[0, a] × p2[0, a] p3[0, a]^2 p3^(0,1)[0, a] yE^(0,1)[0, a] -
4 p2[0, a] p3[0, a]^4 yE^(0,1)[0, a]^2 + 8 kE^2 β p1[0, a]^2 p2[0, a] p3[0, a]^2 Ntot^(1,0)[0, a] +
8 kE^2 β p2[0, a]^2 p3[0, a]^2 Ntot^(1,0)[0, a] +
8 kE^2 μS p1[0, a] × p2[0, a] p3[0, a]^3 Ntot^(1,0)[0, a] -
8 kE^2 β Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 Ntot^(1,0)[0, a] -
8 kE^2 μS Ntot[0, a] × p2[0, a] p3[0, a]^4 Ntot^(1,0)[0, a] +
8 kE β p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] Ntot^(1,0)[0, a] +
8 kE μS p2[0, a] p3[0, a]^4 yE[0, a] Ntot^(1,0)[0, a] -
8 kE^2 p2[0, a] p3[0, a]^4 Ntot^(0,1)[0, a] Ntot^(1,0)[0, a] +
8 kE^2 p2[0, a] p3[0, a]^3 p1^(0,1)[0, a] Ntot^(1,0)[0, a] -
8 kE^2 p1[0, a] × p2[0, a] p3[0, a]^2 p3^(0,1)[0, a] Ntot^(1,0)[0, a] +
8 kE p2[0, a] p3[0, a]^4 yE^(0,1)[0, a] Ntot^(1,0)[0, a] -
4 kE^2 p2[0, a] p3[0, a]^4 Ntot^(1,0)[0, a]^2 -
8 kE^2 β p1[0, a]^2 p2[0, a] × p3[0, a] p1^(1,0)[0, a] - 8 kE^2 β p2[0, a]^2 p3[0, a] p1^(1,0)[0, a] -
8 kE^2 μS p1[0, a] × p2[0, a] p3[0, a]^2 p1^(1,0)[0, a] +
8 kE^2 β Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^2 p1^(1,0)[0, a] +
8 kE^2 μS Ntot[0, a] × p2[0, a] p3[0, a]^3 p1^(1,0)[0, a] -
8 kE β p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p1^(1,0)[0, a] -
8 kE μS p2[0, a] p3[0, a]^3 yE[0, a] p1^(1,0)[0, a] +
8 kE^2 p2[0, a] p3[0, a]^3 Ntot^(0,1)[0, a] p1^(1,0)[0, a] -
8 kE^2 p2[0, a] p3[0, a]^2 p1^(0,1)[0, a] p1^(1,0)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p3^(0,1)[0, a] p1^(1,0)[0, a] -
8 kE p2[0, a] p3[0, a]^3 yE^(0,1)[0, a] p1^(1,0)[0, a] +
8 kE^2 p2[0, a] p3[0, a]^3 Ntot^(1,0)[0, a] p1^(1,0)[0, a] -
4 kE^2 p2[0, a] p3[0, a]^2 p1^(1,0)[0, a]^2 + 8 kE^2 β p1[0, a] × p2[0, a] × p3[0, a] p2^(1,0)[0, a] +
4 kE^2 μS p2[0, a] p3[0, a]^2 p2^(1,0)[0, a] -
4 kE^2 β Ntot[0, a] × p2[0, a] p3[0, a]^2 p2^(1,0)[0, a] +
4 kE β p2[0, a] p3[0, a]^2 yE[0, a] p2^(1,0)[0, a] + 2 kE^2 p3[0, a]^2 p2^(0,1)[0, a] p2^(1,0)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p3^(0,1)[0, a] p2^(1,0)[0, a] + kE^2 p3[0, a]^2 p2^(1,0)[0, a]^2 +
8 kE^2 β p1[0, a]^3 p2[0, a] p3^(1,0)[0, a] - 8 kE^2 β p1[0, a] p2[0, a]^2 p3^(1,0)[0, a] +
8 kE^2 μS p1[0, a]^2 p2[0, a] × p3[0, a] p3^(1,0)[0, a] -
8 kE^2 β Ntot[0, a] p1[0, a]^2 p2[0, a] × p3[0, a] p3^(1,0)[0, a] -
8 kE^2 μS p2[0, a]^2 p3[0, a] p3^(1,0)[0, a] +
8 kE^2 β Ntot[0, a] p2[0, a]^2 p3[0, a] p3^(1,0)[0, a] -
8 kE^2 μS Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^2 p3^(1,0)[0, a] +
8 kE β p1[0, a]^2 p2[0, a] × p3[0, a] × yE[0, a] p3^(1,0)[0, a] -
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8 kE β p2[0, a]^2 p3[0, a] × yE[0, a] p3^(1,0)[0, a] +
8 kE μS p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p3^(1,0)[0, a] -
8 kE^2 p1[0, a] × p2[0, a] p3[0, a]^2 Ntot^(0,1)[0, a] p3^(1,0)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p1^(0,1)[0, a] p3^(1,0)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p2^(0,1)[0, a] p3^(1,0)[0, a] -
8 kE^2 p1[0, a]^2 p2[0, a] p3^(0,1)[0, a] p3^(1,0)[0, a] +
8 kE^2 p2[0, a]^2 p3^(0,1)[0, a] p3^(1,0)[0, a] +
8 kE p1[0, a] × p2[0, a] p3[0, a]^2 yE^(0,1)[0, a] p3^(1,0)[0, a] -
8 kE^2 p1[0, a] × p2[0, a] p3[0, a]^2 Ntot^(1,0)[0, a] p3^(1,0)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p1^(1,0)[0, a] p3^(1,0)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p2^(1,0)[0, a] p3^(1,0)[0, a] - 4 kE^2 p1[0, a]^2 p2[0, a] p3^(1,0)[0, a]^2 +
4 kE^2 p2[0, a]^2 p3^(1,0)[0, a]^2 - 8 kE β p1[0, a]^2 p2[0, a] p3[0, a]^2 yE^(1,0)[0, a] -
8 kE β p2[0, a]^2 p3[0, a]^2 yE^(1,0)[0, a] - 8 kE μS p1[0, a] × p2[0, a] p3[0, a]^3 yE^(1,0)[0, a] +
8 kE β Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 yE^(1,0)[0, a] +
8 kE μS Ntot[0, a] × p2[0, a] p3[0, a]^4 yE^(1,0)[0, a] -
8 β p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] yE^(1,0)[0, a] -
8 μS p2[0, a] p3[0, a]^4 yE[0, a] yE^(1,0)[0, a] +
8 kE p2[0, a] p3[0, a]^4 Ntot^(0,1)[0, a] yE^(1,0)[0, a] -
8 kE p2[0, a] p3[0, a]^3 p1^(0,1)[0, a] yE^(1,0)[0, a] +
8 kE p1[0, a] × p2[0, a] p3[0, a]^2 p3^(0,1)[0, a] yE^(1,0)[0, a] -
8 p2[0, a] p3[0, a]^4 yE^(0,1)[0, a] yE^(1,0)[0, a] +
8 kE p2[0, a] p3[0, a]^4 Ntot^(1,0)[0, a] yE^(1,0)[0, a] -
8 kE p2[0, a] p3[0, a]^3 p1^(1,0)[0, a] yE^(1,0)[0, a] +
8 kE p1[0, a] × p2[0, a] p3[0, a]^2 p3^(1,0)[0, a] yE^(1,0)[0, a] -
4 p2[0, a] p3[0, a]^4 yE^(1,0)[0, a]^2
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Out[•]=

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kE^2 β^2 p1[0, a]^4 - 2 kE^2 β^2 ϵ p1[0, a]^4 + kE^2 β^2 ϵ^2 p1[0, a]^4 - 2 kE^2 β^2 p1[0, a]^2 p2[0, a] +
4 kE^2 β^2 ϵ p1[0, a]^2 p2[0, a] - 2 kE^2 β^2 ϵ^2 p1[0, a]^2 p2[0, a] + kE^2 β^2 p2[0, a]^2 -
2 kE^2 β^2 ϵ p2[0, a]^2 + kE^2 β^2 ϵ^2 p2[0, a]^2 - 2 kE^2 β^2 Ntot[0, a] p1[0, a]^3 p3[0, a] +
4 kE^2 β^2 ϵ Ntot[0, a] p1[0, a]^3 p3[0, a] - 2 kE^2 β^2 ϵ^2 Ntot[0, a] p1[0, a]^3 p3[0, a] +
2 kE^2 β^2 Ntot[0, a] × p1[0, a] × p2[0, a] × p3[0, a] -
4 kE^2 β^2 ϵ Ntot[0, a] × p1[0, a] × p2[0, a] × p3[0, a] +
2 kE^2 β^2 ϵ^2 Ntot[0, a] × p1[0, a] × p2[0, a] × p3[0, a] +
kE^2 β^2 Ntot[0, a]^2 p1[0, a]^2 p3[0, a]^2 - 2 kE^2 β^2 ϵ Ntot[0, a]^2 p1[0, a]^2 p3[0, a]^2 +
kE^2 β^2 ϵ^2 Ntot[0, a]^2 p1[0, a]^2 p3[0, a]^2 - kE^2 β^2 Ntot[0, a]^2 p2[0, a] p3[0, a]^2 +
2 kE^2 β^2 ϵ Ntot[0, a]^2 p2[0, a] p3[0, a]^2 - kE^2 β^2 ϵ^2 Ntot[0, a]^2 p2[0, a] p3[0, a]^2 +
2 kE β^2 p1[0, a]^3 p3[0, a] × yE[0, a] - 4 kE β^2 ϵ p1[0, a]^3 p3[0, a] × yE[0, a] +
2 kE β^2 ϵ^2 p1[0, a]^3 p3[0, a] × yE[0, a] - 2 kE β^2 p1[0, a] × p2[0, a] × p3[0, a] × yE[0, a] +
4 kE β^2 ϵ p1[0, a] × p2[0, a] × p3[0, a] × yE[0, a] -
2 kE β^2 ϵ^2 p1[0, a] × p2[0, a] × p3[0, a] × yE[0, a] + 2 kE β δ p1[0, a]^2 p3[0, a]^2 yE[0, a] -
2 kE β δ ϵ p1[0, a]^2 p3[0, a]^2 yE[0, a] + 2 kE β μE p1[0, a]^2 p3[0, a]^2 yE[0, a] -
2 kE β ϵ μE p1[0, a]^2 p3[0, a]^2 yE[0, a] - 2 kE β^2 Ntot[0, a] p1[0, a]^2 p3[0, a]^2 yE[0, a] +
4 kE β^2 ϵ Ntot[0, a] p1[0, a]^2 p3[0, a]^2 yE[0, a] -
2 kE β^2 ϵ^2 Ntot[0, a] p1[0, a]^2 p3[0, a]^2 yE[0, a] + 2 kE β δ p2[0, a] p3[0, a]^2 yE[0, a] -
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2 kE β δ ϵ p2[0, a] p3[0, a]^2 yE[0, a] + 2 kE β μE p2[0, a] p3[0, a]^2 yE[0, a] -
2 kE β ϵ μE p2[0, a] p3[0, a]^2 yE[0, a] + 2 kE β^2 Ntot[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] -
4 kE β^2 ϵ Ntot[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] +
2 kE β^2 ϵ^2 Ntot[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] -
2 kE β δ Ntot[0, a] × p1[0, a] p3[0, a]^3 yE[0, a] +
2 kE β δ ϵ Ntot[0, a] × p1[0, a] p3[0, a]^3 yE[0, a] -
2 kE β μE Ntot[0, a] × p1[0, a] p3[0, a]^3 yE[0, a] +
2 kE β ϵ μE Ntot[0, a] × p1[0, a] p3[0, a]^3 yE[0, a] +
β^2 p1[0, a]^2 p3[0, a]^2 yE[0, a]^2 - 2 β^2 ϵ p1[0, a]^2 p3[0, a]^2 yE[0, a]^2 +
β^2 ϵ^2 p1[0, a]^2 p3[0, a]^2 yE[0, a]^2 - β^2 p2[0, a] p3[0, a]^2 yE[0, a]^2 +
2 β^2 ϵ p2[0, a] p3[0, a]^2 yE[0, a]^2 - β^2 ϵ^2 p2[0, a] p3[0, a]^2 yE[0, a]^2 +
2 β δ p1[0, a] p3[0, a]^3 yE[0, a]^2 - 2 β δ ϵ p1[0, a] p3[0, a]^3 yE[0, a]^2 +
2 β μE p1[0, a] p3[0, a]^3 yE[0, a]^2 - 2 β ϵ μE p1[0, a] p3[0, a]^3 yE[0, a]^2 +
δ^2 p3[0, a]^4 yE[0, a]^2 + 2 δ μE p3[0, a]^4 yE[0, a]^2 + μE^2 p3[0, a]^4 yE[0, a]^2 +
2 kE β p1[0, a]^2 p3[0, a]^2 yE^(0,1)[0, a] - 2 kE β ϵ p1[0, a]^2 p3[0, a]^2 yE^(0,1)[0, a] +
2 kE β p2[0, a] p3[0, a]^2 yE^(0,1)[0, a] - 2 kE β ϵ p2[0, a] p3[0, a]^2 yE^(0,1)[0, a] -
2 kE β Ntot[0, a] × p1[0, a] p3[0, a]^3 yE^(0,1)[0, a] +
2 kE β ϵ Ntot[0, a] × p1[0, a] p3[0, a]^3 yE^(0,1)[0, a] +
2 β p1[0, a] p3[0, a]^3 yE[0, a] yE^(0,1)[0, a] -
2 β ϵ p1[0, a] p3[0, a]^3 yE[0, a] yE^(0,1)[0, a] + 2 δ p3[0, a]^4 yE[0, a] yE^(0,1)[0, a] +
2 μE p3[0, a]^4 yE[0, a] yE^(0,1)[0, a] + p3[0, a]^4 yE^(0,1)[0, a]^2 +
2 kE β p1[0, a]^2 p3[0, a]^2 yE^(1,0)[0, a] - 2 kE β ϵ p1[0, a]^2 p3[0, a]^2 yE^(1,0)[0, a] +
2 kE β p2[0, a] p3[0, a]^2 yE^(1,0)[0, a] - 2 kE β ϵ p2[0, a] p3[0, a]^2 yE^(1,0)[0, a] -
2 kE β Ntot[0, a] × p1[0, a] p3[0, a]^3 yE^(1,0)[0, a] +
2 kE β ϵ Ntot[0, a] × p1[0, a] p3[0, a]^3 yE^(1,0)[0, a] +
2 β p1[0, a] p3[0, a]^3 yE[0, a] yE^(1,0)[0, a] -
2 β ϵ p1[0, a] p3[0, a]^3 yE[0, a] yE^(1,0)[0, a] +
2 δ p3[0, a]^4 yE[0, a] yE^(1,0)[0, a] + 2 μE p3[0, a]^4 yE[0, a] yE^(1,0)[0, a] +
2 p3[0, a]^4 yE^(0,1)[0, a] yE^(1,0)[0, a] + p3[0, a]^4 yE^(1,0)[0, a]^2
```

Out[•]=

```
- 4 kE^2 β^2 ϵ^2 p1[0, a]^4 p2[0, a] + 8 kE^2 β^2 ϵ^2 p1[0, a]^2 p2[0, a]^2 -
4 kE^2 β^2 ϵ^2 p2[0, a]^3 - 8 kE^2 β ϵ μI p1[0, a]^3 p2[0, a] × p3[0, a] +
8 kE^2 β^2 ϵ^2 Ntot[0, a] p1[0, a]^3 p2[0, a] × p3[0, a] +
8 kE^2 β ϵ μI p1[0, a] p2[0, a]^2 p3[0, a] -
8 kE^2 β^2 ϵ^2 Ntot[0, a] × p1[0, a] p2[0, a]^2 p3[0, a] - 4 kE^2 μI^2 p1[0, a]^2 p2[0, a] p3[0, a]^2 +
8 kE^2 β ϵ μI Ntot[0, a] p1[0, a]^2 p2[0, a] p3[0, a]^2 -
4 kE^2 β^2 ϵ^2 Ntot[0, a]^2 p1[0, a]^2 p2[0, a] p3[0, a]^2 + 4 kE^2 μI^2 p2[0, a]^2 p3[0, a]^2 -
8 kE^2 β ϵ μI Ntot[0, a] p2[0, a]^2 p3[0, a]^2 + 4 kE^2 β^2 ϵ^2 Ntot[0, a]^2 p2[0, a]^2 p3[0, a]^2 -
8 kE β^2 ϵ^2 p1[0, a]^3 p2[0, a] × p3[0, a] × yE[0, a] +
8 kE β^2 ϵ^2 p1[0, a] p2[0, a]^2 p3[0, a] × yE[0, a] +
8 kE β δ ϵ p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a] -
8 kE β ϵ μI p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a] +
8 kE β^2 ϵ^2 Ntot[0, a] p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a] +
8 kE β δ ϵ p2[0, a]^2 p3[0, a]^2 yE[0, a] + 8 kE β ϵ μI p2[0, a]^2 p3[0, a]^2 yE[0, a] -
```

```
8 kE β^2 ϵ^2 Ntot[0, a] p2[0, a]^2 p3[0, a]^2 yE[0, a] +
8 kE δ μI p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] -
8 kE β δ ϵ Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a] -
4 β^2 ϵ^2 p1[0, a]^2 p2[0, a] p3[0, a]^2 yE[0, a]^2 + 4 β^2 ϵ^2 p2[0, a]^2 p3[0, a]^2 yE[0, a]^2 +
8 β δ ϵ p1[0, a] × p2[0, a] p3[0, a]^3 yE[0, a]^2 - 4 δ^2 p2[0, a] p3[0, a]^4 yE[0, a]^2 -
8 kE^2 β ϵ p1[0, a]^2 p2[0, a] × p3[0, a] p1^(0,1)[0, a] -
8 kE^2 β ϵ p2[0, a]^2 p3[0, a] p1^(0,1)[0, a] -
8 kE^2 μI p1[0, a] × p2[0, a] p3[0, a]^2 p1^(0,1)[0, a] +
8 kE^2 β ϵ Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^2 p1^(0,1)[0, a] -
8 kE β ϵ p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p1^(0,1)[0, a] +
8 kE δ p2[0, a] p3[0, a]^3 yE[0, a] p1^(0,1)[0, a] - 4 kE^2 p2[0, a] p3[0, a]^2 p1^(0,1)[0, a]^2 +
8 kE^2 β ϵ p1[0, a] × p2[0, a] × p3[0, a] p2^(0,1)[0, a] +
4 kE^2 μI p2[0, a] p3[0, a]^2 p2^(0,1)[0, a] -
4 kE^2 β ϵ Ntot[0, a] × p2[0, a] p3[0, a]^2 p2^(0,1)[0, a] +
4 kE β ϵ p2[0, a] p3[0, a]^2 yE[0, a] p2^(0,1)[0, a] + kE^2 p3[0, a]^2 p2^(0,1)[0, a]^2 +
8 kE^2 β ϵ p1[0, a]^3 p2[0, a] p3^(0,1)[0, a] - 8 kE^2 β ϵ p1[0, a] p2[0, a]^2 p3^(0,1)[0, a] +
8 kE^2 μI p1[0, a]^2 p2[0, a] × p3[0, a] p3^(0,1)[0, a] -
8 kE^2 β ϵ Ntot[0, a] p1[0, a]^2 p2[0, a] × p3[0, a] p3^(0,1)[0, a] -
8 kE^2 μI p2[0, a]^2 p3[0, a] p3^(0,1)[0, a] +
8 kE^2 β ϵ Ntot[0, a] p2[0, a]^2 p3[0, a] p3^(0,1)[0, a] +
8 kE β ϵ p1[0, a]^2 p2[0, a] × p3[0, a] × yE[0, a] p3^(0,1)[0, a] -
8 kE β ϵ p2[0, a]^2 p3[0, a] × yE[0, a] p3^(0,1)[0, a] -
8 kE δ p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p3^(0,1)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p1^(0,1)[0, a] p3^(0,1)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p2^(0,1)[0, a] p3^(0,1)[0, a] - 4 kE^2 p1[0, a]^2 p2[0, a] p3^(0,1)[0, a]^2 +
4 kE^2 p2[0, a]^2 p3^(0,1)[0, a]^2 - 8 kE^2 β ϵ p1[0, a]^2 p2[0, a] × p3[0, a] p1^(1,0)[0, a] -
8 kE^2 β ϵ p2[0, a]^2 p3[0, a] p1^(1,0)[0, a] -
8 kE^2 μI p1[0, a] × p2[0, a] p3[0, a]^2 p1^(1,0)[0, a] +
8 kE^2 β ϵ Ntot[0, a] × p1[0, a] × p2[0, a] p3[0, a]^2 p1^(1,0)[0, a] -
8 kE β ϵ p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p1^(1,0)[0, a] +
8 kE δ p2[0, a] p3[0, a]^3 yE[0, a] p1^(1,0)[0, a] -
8 kE^2 p2[0, a] p3[0, a]^2 p1^(0,1)[0, a] p1^(1,0)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p3^(0,1)[0, a] p1^(1,0)[0, a] -
4 kE^2 p2[0, a] p3[0, a]^2 p1^(1,0)[0, a]^2 + 8 kE^2 β ϵ p1[0, a] × p2[0, a] ×
 p3[0, a] p2^(1,0)[0, a] + 4 kE^2 μI p2[0, a] p3[0, a]^2 p2^(1,0)[0, a] -
4 kE^2 β ϵ Ntot[0, a] × p2[0, a] p3[0, a]^2 p2^(1,0)[0, a] +
4 kE β ϵ p2[0, a] p3[0, a]^2 yE[0, a] p2^(1,0)[0, a] +
2 kE^2 p3[0, a]^2 p2^(0,1)[0, a] p2^(1,0)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p3^(0,1)[0, a] p2^(1,0)[0, a] + kE^2 p3[0, a]^2 p2^(1,0)[0, a]^2 +
8 kE^2 β ϵ p1[0, a]^3 p2[0, a] p3^(1,0)[0, a] - 8 kE^2 β ϵ p1[0, a] p2[0, a]^2 p3^(1,0)[0, a] +
8 kE^2 μI p1[0, a]^2 p2[0, a] × p3[0, a] p3^(1,0)[0, a] -
8 kE^2 β ϵ Ntot[0, a] p1[0, a]^2 p2[0, a] × p3[0, a] p3^(1,0)[0, a] -
8 kE^2 μI p2[0, a]^2 p3[0, a] p3^(1,0)[0, a] +
8 kE^2 β ϵ Ntot[0, a] p2[0, a]^2 p3[0, a] p3^(1,0)[0, a] +
```

```
8 kE β ϵ p1[0, a]^2 p2[0, a] × p3[0, a] × yE[0, a] p3^(1,0)[0, a] -
8 kE β ϵ p2[0, a]^2 p3[0, a] × yE[0, a] p3^(1,0)[0, a] -
8 kE δ p1[0, a] × p2[0, a] p3[0, a]^2 yE[0, a] p3^(1,0)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p1^(0,1)[0, a] p3^(1,0)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p2^(0,1)[0, a] p3^(1,0)[0, a] -
8 kE^2 p1[0, a]^2 p2[0, a] p3^(0,1)[0, a] p3^(1,0)[0, a] +
8 kE^2 p2[0, a]^2 p3^(0,1)[0, a] p3^(1,0)[0, a] +
8 kE^2 p1[0, a] × p2[0, a] × p3[0, a] p1^(1,0)[0, a] p3^(1,0)[0, a] -
4 kE^2 p2[0, a] × p3[0, a] p2^(1,0)[0, a] p3^(1,0)[0, a] -
4 kE^2 p1[0, a]^2 p2[0, a] p3^(1,0)[0, a]^2 + 4 kE^2 p2[0, a]^2 p3^(1,0)[0, a]^2
```

In[∘]:=

```
(* BIG NOTE!! The next bit is not automated,
so if you change stuff above, you'll need to redo this! *)
```

In[∘]:= $\mathbf{p1[t, a] = kI\,\beta\,\epsilon\,Ntot[t, a] - \frac{kI\,\beta\,\epsilon\,yE[t, a]}{kE}}$

$\mathbf{p2[t, a] = \left(kI\,\beta\,\epsilon\,Ntot[t, a] - \frac{kI\,\beta\,\epsilon\,yE[t, a]}{kE}\right)^2 + 4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[t, a]}{kE} - yI[t, a]\right)}$

$\mathbf{p3[t, a] = 2\,kI\,\beta\,\epsilon}$

Out[∘]= $kI\,\beta\,\epsilon\,Ntot[t, a] - \frac{kI\,\beta\,\epsilon\,yE[t, a]}{kE}$

Out[∘]= $\left(kI\,\beta\,\epsilon\,Ntot[t, a] - \frac{kI\,\beta\,\epsilon\,yE[t, a]}{kE}\right)^2 + 4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[t, a]}{kE} - yI[t, a]\right)$

Out[∘]= $2\,kI\,\beta\,\epsilon$

In[ ]:=

```
p1[0, a] = p1[t, a] /. t → 0
p2[0, a] = p2[t, a] /. t → 0
p3[0, a] = p3[t, a] /. t → 0
p1^(1,0)[0, a] = D[p1[t, a], t] /. t → 0
p1^(0,1)[0, a] = D[p1[t, a], a] /. t → 0
p2^(1,0)[0, a] = D[p2[t, a], t] /. t → 0
p2^(0,1)[0, a] = D[p2[t, a], a] /. t → 0
p3^(1,0)[0, a] = D[p3[t, a], t] /. t → 0
p3^(0,1)[0, a] = D[p3[t, a], a] /. t → 0
```

Out[ ]= $\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0, a]}{\mathrm{kE}}$

Out[ ]= $\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0, a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0, a]}{\mathrm{kE}} - \mathrm{yI}[0, a]\right)$

Out[ ]= $2\,\mathrm{kI}\,\beta\,\epsilon$

Out[ ]= $\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0, a]}{\mathrm{kE}}$

Out[ ]= $\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0, a]}{\mathrm{kE}}$

Out[ ]= $2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0, a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0, a]}{\mathrm{kE}}\right) + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0, a]}{\mathrm{kE}} - \mathrm{yI}^{(1,0)}[0, a]\right)$

Out[ ]= $2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0, a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0, a]}{\mathrm{kE}}\right) + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(0,1)}[0, a]}{\mathrm{kE}} - \mathrm{yI}^{(0,1)}[0, a]\right)$

Out[ ]= 0

Out[ ]= 0

In[ ]:=

```
s2thing2[a]
EE2thing2[a]
II2thing2[a]
```

Out[ ]= $-64\,\mathrm{kE}^2\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\,\mu\mathrm{S}^2\,\mathrm{Ntot}[0, a]^2$

$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0, a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0, a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0, a]}{\mathrm{kE}} - \mathrm{yI}[0, a]\right)\right) +$

$$128\,\mathrm{kE}\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\,\mu\mathrm{S}^2\,\mathrm{Ntot}[0,\mathrm{a}]\times\mathrm{yE}[0,\mathrm{a}]$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-64\,\mathrm{kI}^4\,\beta^4\,\epsilon^4$$
$$\mu\mathrm{S}^2\,\mathrm{yE}[0,\mathrm{a}]^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$
$$64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\,\mu\mathrm{S}^2\,\mathrm{Ntot}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$
$$64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mu\mathrm{S}\,\mathrm{Ntot}[0,\mathrm{a}]^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$
$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\,\mu\mathrm{S}^2\,\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$
$$128\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mu\mathrm{S}\,\mathrm{Ntot}[0,\mathrm{a}]\times\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$
$$64\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mu\mathrm{S}\,\mathrm{yE}[0,\mathrm{a}]^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$
$$16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\,\mu\mathrm{S}^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$
$$64\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\,\mu\mathrm{S}\,\mathrm{Ntot}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$
$$16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^4\,\epsilon^2\,\mathrm{Ntot}[0,\mathrm{a}]^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$64\,kE\,kI^2\,\beta^3\,\epsilon^2\,\mu S\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$
$$32\,kE\,kI^2\,\beta^4\,\epsilon^2\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$16\,kI^2\,\beta^4\,\epsilon^2\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$16\,kE^2\,kI\,\beta^2\,\epsilon\,\mu S\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$
$$16\,kE^2\,kI\,\beta^3\,\epsilon\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$16\,kE\,kI\,\beta^3\,\epsilon\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$4\,kE^2\,\beta^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^4$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+16\,kE^2\,kI^2$$
$$\beta^2\,\epsilon^2\,\mu S^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$16\,kE^2\,kI^2\,\beta^4\,\epsilon^2\,Ntot[0,a]^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2-$$
$$32\,kE\,kI^2\,\beta^4\,\epsilon^2\,Ntot[0,a]\times yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+16\,kI^2\,\beta^4\,\epsilon^2$$

$$\mathrm{yE}[0,a]^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)^2+$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon\,\mu\mathrm{S}\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)^2-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^3\,\epsilon\,\mathrm{Ntot}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)^2+$$

$$16\,\mathrm{kE}\,\mathrm{kI}\,\beta^3\,\epsilon\,\mathrm{yE}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)^2+$$

$$8\,\mathrm{kE}^2\,\beta^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)^2-$$

$$4\,\mathrm{kE}^2\,\beta^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)^3-$$

$$128\,\mathrm{kE}^2\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\,\mu\mathrm{S}\,\mathrm{Ntot}[0,a]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,a]+128\,\mathrm{kE}\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\,\mu\mathrm{S}\,\mathrm{yE}[0,a]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,a]+64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\,\mu\mathrm{S}\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,a]-64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mathrm{Ntot}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,a]+64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mathrm{yE}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,a] + 32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)$$
$$\mathrm{Ntot}^{(0,1)}[0,a] +$$
$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)^2$$
$$\mathrm{Ntot}^{(0,1)}[0,a] -$$
$$64\,\mathrm{kE}^2\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)$$
$$\mathrm{Ntot}^{(0,1)}[0,a]^2 + 128\,\mathrm{kE}\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\,\mu\mathrm{S}\,\mathrm{Ntot}[0,a]$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)$$
$$\mathrm{yE}^{(0,1)}[0,a] - 128\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\,\mu\mathrm{S}\,\mathrm{yE}[0,a]$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)\mathrm{yE}^{(0,1)}[0,a] -$$
$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\,\mu\mathrm{S}\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)\mathrm{yE}^{(0,1)}[0,a] +$$
$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mathrm{Ntot}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)\mathrm{yE}^{(0,1)}[0,a] -$$
$$64\,\mathrm{kI}^3\,\beta^4\,\epsilon^3\,\mathrm{yE}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)\mathrm{yE}^{(0,1)}[0,a] -$$
$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2$$
$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)\mathrm{yE}^{(0,1)}[0,a] -$$
$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)^2$$
$$\mathrm{yE}^{(0,1)}[0,a] +$$
$$128\,\mathrm{kE}\,\mathrm{kI}^4\,\beta^4\,\epsilon^4\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a] - \frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2 + 4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}} - \mathrm{yI}[0,a]\right)\right)$$
$$\mathrm{Ntot}^{(0,1)}[0,a]\,\mathrm{yE}^{(0,1)}[0,a] -$$

$$64\,kI^4\,\beta^4\,\epsilon^4\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$yE^{(0,1)}[0,a]^2+64\,kE^2\,kI^3\,\beta^3\,\epsilon^3\,\mu S\,Ntot[0,a]$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)-64\,kE\,kI^3\,\beta^3\,\epsilon^3\,\mu S\,yE[0,a]$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)-$$

$$32\,kE^2\,kI^2\,\beta^2\,\epsilon^2\,\mu S\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+$$

$$32\,kE^2\,kI^2\,\beta^3\,\epsilon^2\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)-$$

$$32\,kE\,kI^2\,\beta^3\,\epsilon^2\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)-$$

$$16\,kE^2\,kI\,\beta^2\,\epsilon\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)-$$

$$16\,kE^2\,kI\,\beta^2\,\epsilon\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)+$$

$$64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)-$$

$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\mathrm{yE}^{(0,1)}[0,a]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)^2+16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\,\mu\mathrm{S}$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(0,1)}[0,a]\right)\right)-16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\,\mathrm{Ntot}[0,a]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(0,1)}[0,a]\right)\right)+16\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\,\mathrm{yE}[0,a]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(0,1)}[0,a]\right)\right)+$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)+4\,kE^2\,kI^2\,\beta^2\,\epsilon^2$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)^2-128\,kE^2\,kI^4\,\beta^4\,\epsilon^4\,\mu S\,Ntot[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(1,0)}[0,a]+128\,kE\,kI^4\,\beta^4\,\epsilon^4\,\mu S\,yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(1,0)}[0,a]+64\,kE^2\,kI^3\,\beta^3\,\epsilon^3\,\mu S\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(1,0)}[0,a]-64\,kE^2\,kI^3\,\beta^4\,\epsilon^3\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(1,0)}[0,a]+64\,kE\,kI^3\,\beta^4\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(1,0)}[0,a]+32\,kE^2\,kI^2\,\beta^3\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(1,0)}[0,a]+$$
$$32\,kE^2\,kI^2\,\beta^3\,\epsilon^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2$$
$$Ntot^{(1,0)}[0,a]-$$
$$128\,kE^2\,kI^4\,\beta^4\,\epsilon^4\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$Ntot^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a]+$$
$$128\,kE\,kI^4\,\beta^4\,\epsilon^4\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$yE^{(0,1)}[0, a]\, Ntot^{(1,0)}[0, a] +$$

$$64\, kE^2\, kI^3\, \beta^3\, \epsilon^3 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right)$$

$$\left(kI\, \beta\, \epsilon\, Ntot^{(0,1)}[0, a] - \frac{kI\, \beta\, \epsilon\, yE^{(0,1)}[0, a]}{kE}\right) Ntot^{(1,0)}[0, a] -$$

$$64\, kE^2\, kI^4\, \beta^4\, \epsilon^4 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right)$$

$$Ntot^{(1,0)}[0, a]^2 + 128\, kE\, kI^4\, \beta^4\, \epsilon^4\, \mu S\, Ntot[0, a]$$

$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right)$$

$$yE^{(1,0)}[0, a] - 128\, kI^4\, \beta^4\, \epsilon^4\, \mu S\, yE[0, a]$$

$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) yE^{(1,0)}[0, a] -$$

$$64\, kE\, kI^3\, \beta^3\, \epsilon^3\, \mu S \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$

$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) yE^{(1,0)}[0, a] +$$

$$64\, kE\, kI^3\, \beta^4\, \epsilon^3\, Ntot[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$

$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) yE^{(1,0)}[0, a] -$$

$$64\, kI^3\, \beta^4\, \epsilon^3\, yE[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$

$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) yE^{(1,0)}[0, a] -$$

$$32\, kE\, kI^2\, \beta^3\, \epsilon^2 \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2$$

$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) yE^{(1,0)}[0, a] -$$

$$32\, kE\, kI^2\, \beta^3\, \epsilon^2 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right)^2$$

$$yE^{(1,0)}[0, a] +$$

$$128\, kE\, kI^4\, \beta^4\, \epsilon^4 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right)$$

$$Ntot^{(0,1)}[0, a]\, yE^{(1,0)}[0, a] -$$

$$128\, kI^4\, \beta^4\, \epsilon^4 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right)$$

$$yE^{(0,1)}[0, a]\, yE^{(1,0)}[0, a] -$$

$$64\,kE\,kI^3\,\beta^3\,\epsilon^3\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)yE^{(1,0)}[0,a]+$$

$$128\,kE\,kI^4\,\beta^4\,\epsilon^4\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$Ntot^{(1,0)}[0,a]\,yE^{(1,0)}[0,a]-$$

$$64\,kI^4\,\beta^4\,\epsilon^4\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$yE^{(1,0)}[0,a]^2+64\,kE^2\,kI^3\,\beta^3\,\epsilon^3\,\mu S\,Ntot[0,a]$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)-64\,kE\,kI^3\,\beta^3\,\epsilon^3\,\mu S\,yE[0,a]$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)-$$

$$32\,kE^2\,kI^2\,\beta^2\,\epsilon^2\,\mu S\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+$$

$$32\,kE^2\,kI^2\,\beta^3\,\epsilon^2\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)-$$

$$32\,kE\,kI^2\,\beta^3\,\epsilon^2\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)-$$

$$16\,kE^2\,kI\,\beta^2\,\epsilon\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)^2$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)+$$

$$64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\mathrm{yE}^{(0,1)}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)+$$

$$64\,\mathrm{kE}^2\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^3\,\epsilon^3\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\mathrm{yE}^{(1,0)}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\,\mu\mathrm{S}$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(1,0)}[0,a]\right)\right)-16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\,\mathrm{Ntot}[0,a]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(1,0)}[0,a]\right)\right)+16\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^2\,\mathrm{yE}[0,a]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(1,0)}[0,a]\right)\right)+$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,a]}{\mathrm{kE}}-\mathrm{yI}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(1,0)}[0,a]\right)\right)+8\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(0,1)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(0,1)}[0,a]\right)\right)$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(1,0)}[0,a]\right)\right)+4\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2$$

$$\left(2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,a]}{\mathrm{kE}}\right)\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,a]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}\right)+\right.$$

$$\left.4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}^{(1,0)}[0,a]}{\mathrm{kE}}-\mathrm{yI}^{(1,0)}[0,a]\right)\right)^2$$

Out[•]=

$$
\begin{aligned}
&16\,kI^4\,\beta^4\,\delta^2\,\epsilon^4\,yE[0,a]^2 + 32\,kI^4\,\beta^4\,\delta\,\epsilon^4\,\mu E\,yE[0,a]^2 + 16\,kI^4\,\beta^4\,\epsilon^4\,\mu E^2\,yE[0,a]^2 - \\
&16\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^3\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) + \\
&16\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^4\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) - \\
&16\,kE\,kI^3\,\beta^4\,\epsilon^3\,\mu E\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) + \\
&16\,kE\,kI^3\,\beta^4\,\epsilon^4\,\mu E\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) + \\
&16\,kI^3\,\beta^4\,\delta\,\epsilon^3\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) - \\
&16\,kI^3\,\beta^4\,\delta\,\epsilon^4\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) + \\
&16\,kI^3\,\beta^4\,\epsilon^3\,\mu E\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) - \\
&16\,kI^3\,\beta^4\,\epsilon^4\,\mu E\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right) + \\
&4\,kE^2\,kI^2\,\beta^4\,\epsilon^2\,Ntot[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 - \\
&8\,kE^2\,kI^2\,\beta^4\,\epsilon^3\,Ntot[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 + \\
&4\,kE^2\,kI^2\,\beta^4\,\epsilon^4\,Ntot[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 + \\
&8\,kE\,kI^2\,\beta^3\,\delta\,\epsilon^2\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 - \\
&8\,kE\,kI^2\,\beta^3\,\delta\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 + \\
&8\,kE\,kI^2\,\beta^3\,\epsilon^2\,\mu E\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 - \\
&8\,kE\,kI^2\,\beta^3\,\epsilon^3\,\mu E\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 - \\
&8\,kE\,kI^2\,\beta^4\,\epsilon^2\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 + \\
&16\,kE\,kI^2\,\beta^4\,\epsilon^3\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 - \\
&8\,kE\,kI^2\,\beta^4\,\epsilon^4\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 + \\
&4\,kI^2\,\beta^4\,\epsilon^2\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a] - \frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2 -
\end{aligned}
$$

$$8\,kI^2\,\beta^4\,\epsilon^3\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+$$

$$4\,kI^2\,\beta^4\,\epsilon^4\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2-$$

$$4\,kE^2\,kI\,\beta^3\,\epsilon\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3+$$

$$8\,kE^2\,kI\,\beta^3\,\epsilon^2\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3-$$

$$4\,kE^2\,kI\,\beta^3\,\epsilon^3\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3+$$

$$4\,kE\,kI\,\beta^3\,\epsilon\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3-$$

$$8\,kE\,kI\,\beta^3\,\epsilon^2\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3+$$

$$4\,kE\,kI\,\beta^3\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^3+$$

$$kE^2\,\beta^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^4-$$

$$2\,kE^2\,\beta^2\,\epsilon\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^4+$$

$$kE^2\,\beta^2\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^4-4\,kE^2\,kI^2\,\beta^4\,\epsilon^2\,Ntot[0,a]^2$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$

$$8\,kE^2\,kI^2\,\beta^4\,\epsilon^3\,Ntot[0,a]^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+\right.$$

$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-4\,kE^2\,kI^2\,\beta^4\,\epsilon^4\,Ntot[0,a]^2$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+8\,kE\,kI^2\,\beta^3$$

$$\delta\,\epsilon^2\,yE[0,a]\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$

$$8\,kE\,kI^2\,\beta^3\,\delta\,\epsilon^3\,yE[0,a]\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+\right.$$

$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+8\,kE\,kI^2\,\beta^3\,\epsilon^2\,\mu E\,yE[0,a]$$

$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-8\,kE\,kI^2\,\beta^3\,\epsilon^3$$

$$\mu E\, yE[0, a] \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) +$$
$$8\, kE\, kI^2\, \beta^4\, \epsilon^2\, Ntot[0, a] \times yE[0, a]$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) -$$
$$16\, kE\, kI^2\, \beta^4\, \epsilon^3\, Ntot[0, a] \times yE[0, a]$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) +$$
$$8\, kE\, kI^2\, \beta^4\, \epsilon^4\, Ntot[0, a] \times yE[0, a]$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) - 4\, kI^2\, \beta^4\, \epsilon^2$$
$$yE[0, a]^2 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) + 8$$
$$kI^2\, \beta^4\, \epsilon^3\, yE[0, a]^2$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) - 4\, kI^2\, \beta^4\, \epsilon^4$$
$$yE[0, a]^2 \left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) +$$
$$4\, kE^2\, kI\, \beta^3\, \epsilon\, Ntot[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) -$$
$$8\, kE^2\, kI\, \beta^3\, \epsilon^2\, Ntot[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) +$$
$$4\, kE^2\, kI\, \beta^3\, \epsilon^3\, Ntot[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) -$$
$$4\, kE\, kI\, \beta^3\, \epsilon\, yE[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) +$$
$$8\, kE\, kI\, \beta^3\, \epsilon^2\, yE[0, a] \left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)$$
$$\left(\left(kI\, \beta\, \epsilon\, Ntot[0, a] - \frac{kI\, \beta\, \epsilon\, yE[0, a]}{kE}\right)^2 + 4\, kI\, \beta\, \epsilon \left(\frac{kI\, \delta\, yE[0, a]}{kE} - yI[0, a]\right)\right) -$$

$$4\,kE\,kI\,\beta^3\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$2\,kE^2\,\beta^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$
$$4\,kE^2\,\beta^2\,\epsilon\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$2\,kE^2\,\beta^2\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$
$$kE^2\,\beta^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2-$$
$$2\,kE^2\,\beta^2\,\epsilon\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$kE^2\,\beta^2\,\epsilon^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$32\,kI^4\,\beta^4\,\delta\,\epsilon^4\,yE[0,a]\,yE^{(0,1)}[0,a]+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E\,yE[0,a]\,yE^{(0,1)}[0,a]-$$
$$16\,kE\,kI^3\,\beta^4\,\epsilon^3\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(0,1)}[0,a]+$$
$$16\,kE\,kI^3\,\beta^4\,\epsilon^4\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(0,1)}[0,a]+$$
$$16\,kI^3\,\beta^4\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(0,1)}[0,a]-$$
$$16\,kI^3\,\beta^4\,\epsilon^4\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(0,1)}[0,a]+$$
$$8\,kE\,kI^2\,\beta^3\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2yE^{(0,1)}[0,a]-$$
$$8\,kE\,kI^2\,\beta^3\,\epsilon^3\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2yE^{(0,1)}[0,a]+8\,kE\,kI^2\,\beta^3\,\epsilon^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)yE^{(0,1)}[0,a]-$$

$$8\,kE\,kI^2\,\beta^3\,\epsilon^3\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$yE^{(0,1)}[0,a]+16\,kI^4\,\beta^4\,\epsilon^4\,yE^{(0,1)}[0,a]^2+$$
$$32\,kI^4\,\beta^4\,\delta\,\epsilon^4\,yE[0,a]\,yE^{(1,0)}[0,a]+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E\,yE[0,a]\,yE^{(1,0)}[0,a]-$$
$$16\,kE\,kI^3\,\beta^4\,\epsilon^3\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(1,0)}[0,a]+$$
$$16\,kE\,kI^3\,\beta^4\,\epsilon^4\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(1,0)}[0,a]+$$
$$16\,kI^3\,\beta^4\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(1,0)}[0,a]-$$
$$16\,kI^3\,\beta^4\,\epsilon^4\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)yE^{(1,0)}[0,a]+$$
$$8\,kE\,kI^2\,\beta^3\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2yE^{(1,0)}[0,a]-$$
$$8\,kE\,kI^2\,\beta^3\,\epsilon^3\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2yE^{(1,0)}[0,a]+8\,kE\,kI^2\,\beta^3\,\epsilon^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)yE^{(1,0)}[0,a]-$$
$$8\,kE\,kI^2\,\beta^3\,\epsilon^3\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$yE^{(1,0)}[0,a]+32\,kI^4\,\beta^4\,\epsilon^4\,yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a]+16\,kI^4\,\beta^4\,\epsilon^4\,yE^{(1,0)}[0,a]^2$$

Out[•]=
$$-64\,kI^4\,\beta^4\,\delta^2\,\epsilon^4\,yE[0,a]^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$
$$64\,kE\,kI^3\,\beta^3\,\delta\,\epsilon^3\,\mu I\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$64\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^4\,Ntot[0,a]\times yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+$$
$$64\,kI^3\,\beta^4\,\delta\,\epsilon^4\,yE[0,a]^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)-$$
$$16\,kE^2\,kI^2\,\beta^2\,\epsilon^2\,\mu I^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^3\,\mu\mathrm{I}\,\mathrm{Ntot}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^4\,\epsilon^4\,\mathrm{Ntot}[0,\mathrm{a}]^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$

$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\delta\,\epsilon^3\,\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^3\,\mu\mathrm{I}\,\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$

$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^4\,\epsilon^4\,\mathrm{Ntot}[0,\mathrm{a}]\times\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$16\,\mathrm{kI}^2\,\beta^4\,\epsilon^4\,\mathrm{yE}[0,\mathrm{a}]^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon^2\,\mu\mathrm{I}\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^3$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)+$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^3\,\epsilon^3\,\mathrm{Ntot}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^3$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$16\,\mathrm{kE}\,\mathrm{kI}\,\beta^3\,\epsilon^3\,\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^3$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)-$$

$$4\,kE^2\,\beta^2\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^4$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)+16\,kE^2\,kI^2$$
$$\beta^2\,\epsilon^2\,\mu I^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2-$$
$$32\,kE^2\,kI^2\,\beta^3\,\epsilon^3\,\mu I\,Ntot[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$16\,kE^2\,kI^2\,\beta^4\,\epsilon^4\,Ntot[0,a]^2$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$32\,kE\,kI^2\,\beta^3\,\delta\,\epsilon^3\,yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$32\,kE\,kI^2\,\beta^3\,\epsilon^3\,\mu I\,yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2-$$
$$32\,kE\,kI^2\,\beta^4\,\epsilon^4\,Ntot[0,a]\times yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+16\,kI^2\,\beta^4\,\epsilon^4$$
$$yE[0,a]^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$16\,kE^2\,kI\,\beta^2\,\epsilon^2\,\mu I\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2-$$
$$16\,kE^2\,kI\,\beta^3\,\epsilon^3\,Ntot[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$16\,kE\,kI\,\beta^3\,\epsilon^3\,yE[0,a]\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)^2+$$
$$8\,kE^2\,\beta^2\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)^2-$$

$$4\,\mathrm{kE}^2\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)^3+$$

$$64\,\mathrm{kE}\,\mathrm{kI}^3\,\beta^3\,\delta\,\epsilon^3\,\mathrm{yE}[0,\mathrm{a}]$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\,\mu\mathrm{I}\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)+$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^3\,\mathrm{Ntot}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^3\,\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)^2$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,kE^2\,kI^2\,\beta^2\,\epsilon^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)^2+16\,kE^2\,kI^2\,\beta^2\,\epsilon^2\,\mu I$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)-16\,kE^2\,kI^2\,\beta^3\,\epsilon^3\,Ntot[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)+16\,kE\,kI^2\,\beta^3\,\epsilon^3\,yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)+$$
$$16\,kE^2\,kI\,\beta^2\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)+4\,kE^2\,kI^2\,\beta^2\,\epsilon^2$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)^2+64\,kE\,kI^3\,\beta^3\,\delta\,\epsilon^3\,yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\,\mu\mathrm{I}\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)+$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^3\,\epsilon^3\,\mathrm{Ntot}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$32\,\mathrm{kE}\,\mathrm{kI}^2\,\beta^3\,\epsilon^3\,\mathrm{yE}[0,\mathrm{a}]\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon^2\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2$$

$$\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,\mathrm{kE}^2\,\mathrm{kI}\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)^2$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$32\,\mathrm{kE}^2\,\mathrm{kI}^2\,\beta^2\,\epsilon^2\left(\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}\right)^2+4\,\mathrm{kI}\,\beta\,\epsilon\left(\frac{\mathrm{kI}\,\delta\,\mathrm{yE}[0,\mathrm{a}]}{\mathrm{kE}}-\mathrm{yI}[0,\mathrm{a}]\right)\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(0,1)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(0,1)}[0,\mathrm{a}]}{\mathrm{kE}}\right)$$

$$\left(\mathrm{kI}\,\beta\,\epsilon\,\mathrm{Ntot}^{(1,0)}[0,\mathrm{a}]-\frac{\mathrm{kI}\,\beta\,\epsilon\,\mathrm{yE}^{(1,0)}[0,\mathrm{a}]}{\mathrm{kE}}\right)-$$

$$16\,kE^2\,kI^2\,\beta^2\,\epsilon^2\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)^2+16\,kE^2\,kI^2\,\beta^2\,\epsilon^2\,\mu I$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(1,0)}[0,a]}{kE}-yI^{(1,0)}[0,a]\right)\right)-16\,kE^2\,kI^2\,\beta^3\,\epsilon^3\,Ntot[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(1,0)}[0,a]}{kE}-yI^{(1,0)}[0,a]\right)\right)+16\,kE\,kI^2\,\beta^3\,\epsilon^3\,yE[0,a]$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(1,0)}[0,a]}{kE}-yI^{(1,0)}[0,a]\right)\right)+$$
$$16\,kE^2\,kI\,\beta^2\,\epsilon^2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)$$
$$\left(\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)^2+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE[0,a]}{kE}-yI[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(1,0)}[0,a]}{kE}-yI^{(1,0)}[0,a]\right)\right)+8\,kE^2\,kI^2\,\beta^2\,\epsilon^2$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(0,1)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(0,1)}[0,a]}{kE}\right)+\right.$$
$$\left.4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(0,1)}[0,a]}{kE}-yI^{(0,1)}[0,a]\right)\right)$$
$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+\right.$$

$$4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(1,0)}[0,a]}{kE}-yI^{(1,0)}[0,a]\right)\Bigg)+4\,kE^2\,kI^2\,\beta^2\,\epsilon^2$$

$$\left(2\left(kI\,\beta\,\epsilon\,Ntot[0,a]-\frac{kI\,\beta\,\epsilon\,yE[0,a]}{kE}\right)\left(kI\,\beta\,\epsilon\,Ntot^{(1,0)}[0,a]-\frac{kI\,\beta\,\epsilon\,yE^{(1,0)}[0,a]}{kE}\right)+4\,kI\,\beta\,\epsilon\left(\frac{kI\,\delta\,yE^{(1,0)}[0,a]}{kE}-yI^{(1,0)}[0,a]\right)\right)^2$$

In[∘]:=
```
IPOPish1[a_] = Denominator[Together[s2thing2[a]]] × Together[s2thing2[a]]
IPOPish2[a_] = Denominator[Together[EE2thing2[a]]] × Together[EE2thing2[a]]
IPOPish3[a_] = Denominator[Together[II2thing2[a]]] × Together[II2thing2[a]]
```

Out[∘]=

$$-64\,\beta^4\,\Big(-kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S^2\,Ntot[0,a]^2\,yE[0,a]-$$
$$kE^3\,kI^6\,\beta^2\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^3\,yE[0,a]-4\,kE^2\,kI^6\,\delta^2\,\epsilon^4\,\mu S^2\,yE[0,a]^2-$$
$$4\,kE^2\,kI^6\,\beta\,\delta^2\,\epsilon^4\,\mu S\,Ntot[0,a]\,yE[0,a]^2+2\,kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S^2\,Ntot[0,a]\,yE[0,a]^2+$$
$$kE^2\,kI^6\,\beta^2\,\delta^2\,\epsilon^4\,Ntot[0,a]^2\,yE[0,a]^2+3\,kE^2\,kI^6\,\beta^2\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^2\,yE[0,a]^2+$$
$$4\,kE\,kI^6\,\beta\,\delta^3\,\epsilon^3\,yE[0,a]^3+4\,kE\,kI^6\,\beta\,\delta^2\,\epsilon^4\,\mu S\,yE[0,a]^3-kE\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S^2\,yE[0,a]^3-$$
$$2\,kE\,kI^6\,\beta^2\,\delta^2\,\epsilon^4\,Ntot[0,a]\,yE[0,a]^3-3\,kE\,kI^6\,\beta^2\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]\,yE[0,a]^3+$$
$$kI^6\,\beta^2\,\delta^2\,\epsilon^4\,yE[0,a]^4+kI^6\,\beta^2\,\delta\,\epsilon^5\,\mu S\,yE[0,a]^4+kE^4\,kI^5\,\beta\,\epsilon^5\,\mu S^2\,Ntot[0,a]^2\,yI[0,a]+$$
$$kE^4\,kI^5\,\beta^2\,\epsilon^5\,\mu S\,Ntot[0,a]^3\,yI[0,a]+8\,kE^3\,kI^5\,\delta\,\epsilon^4\,\mu S^2\,yE[0,a]\times yI[0,a]+$$
$$8\,kE^3\,kI^5\,\beta\,\delta\,\epsilon^4\,\mu S\,Ntot[0,a]\times yE[0,a]\times yI[0,a]-$$
$$2\,kE^3\,kI^5\,\beta\,\epsilon^5\,\mu S^2\,Ntot[0,a]\times yE[0,a]\times yI[0,a]-$$
$$2\,kE^3\,kI^5\,\beta^2\,\delta\,\epsilon^4\,Ntot[0,a]^2\,yE[0,a]\times yI[0,a]-$$
$$3\,kE^3\,kI^5\,\beta^2\,\epsilon^5\,\mu S\,Ntot[0,a]^2\,yE[0,a]\times yI[0,a]-$$
$$12\,kE^2\,kI^5\,\beta\,\delta^2\,\epsilon^3\,yE[0,a]^2\,yI[0,a]-8\,kE^2\,kI^5\,\beta\,\delta\,\epsilon^4\,\mu S\,yE[0,a]^2\,yI[0,a]+$$
$$kE^2\,kI^5\,\beta\,\epsilon^5\,\mu S^2\,yE[0,a]^2\,yI[0,a]+4\,kE^2\,kI^5\,\beta^2\,\delta\,\epsilon^4\,Ntot[0,a]\,yE[0,a]^2\,yI[0,a]+$$
$$3\,kE^2\,kI^5\,\beta^2\,\epsilon^5\,\mu S\,Ntot[0,a]\,yE[0,a]^2\,yI[0,a]-2\,kE\,kI^5\,\beta^2\,\delta\,\epsilon^4\,yE[0,a]^3\,yI[0,a]-$$
$$kE\,kI^5\,\beta^2\,\epsilon^5\,\mu S\,yE[0,a]^3\,yI[0,a]-4\,kE^4\,kI^4\,\epsilon^4\,\mu S^2\,yI[0,a]^2-$$
$$4\,kE^4\,kI^4\,\beta\,\epsilon^4\,\mu S\,Ntot[0,a]\,yI[0,a]^2+kE^4\,kI^4\,\beta^2\,\epsilon^4\,Ntot[0,a]^2\,yI[0,a]^2+$$
$$12\,kE^3\,kI^4\,\beta\,\delta\,\epsilon^3\,yE[0,a]\,yI[0,a]^2+4\,kE^3\,kI^4\,\beta\,\epsilon^4\,\mu S\,yE[0,a]\,yI[0,a]^2-$$
$$2\,kE^3\,kI^4\,\beta^2\,\epsilon^4\,Ntot[0,a]\times yE[0,a]\,yI[0,a]^2+kE^2\,kI^4\,\beta^2\,\epsilon^4\,yE[0,a]^2\,yI[0,a]^2-$$
$$4\,kE^4\,kI^3\,\beta\,\epsilon^3\,yI[0,a]^3-kE^3\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]^2\,yE[0,a]\,Ntot^{(0,1)}[0,a]-$$
$$4\,kE^2\,kI^6\,\beta\,\delta^2\,\epsilon^4\,yE[0,a]^2\,Ntot^{(0,1)}[0,a]+$$
$$2\,kE^2\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]\,yE[0,a]^2\,Ntot^{(0,1)}[0,a]-$$
$$kE\,kI^6\,\beta^2\,\delta\,\epsilon^5\,yE[0,a]^3\,Ntot^{(0,1)}[0,a]+kE^4\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]^2\,yI[0,a]$$
$$Ntot^{(0,1)}[0,a]+8\,kE^3\,kI^5\,\beta\,\delta\,\epsilon^4\,yE[0,a]\times yI[0,a]\,Ntot^{(0,1)}[0,a]-$$
$$2\,kE^3\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]\times yE[0,a]\times yI[0,a]\,Ntot^{(0,1)}[0,a]+$$
$$kE^2\,kI^5\,\beta^2\,\epsilon^5\,yE[0,a]^2\,yI[0,a]\,Ntot^{(0,1)}[0,a]-4\,kE^4\,kI^4\,\beta\,\epsilon^4\,yI[0,a]^2\,Ntot^{(0,1)}[0,a]+$$
$$kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,yE[0,a]\,Ntot^{(0,1)}[0,a]^2-kE^4\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,Ntot^{(0,1)}[0,a]^2-$$
$$kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^2\,yE^{(0,1)}[0,a]-4\,kE^2\,kI^6\,\delta^2\,\epsilon^4\,\mu S\,yE[0,a]\,yE^{(0,1)}[0,a]+$$
$$2\,kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]\times yE[0,a]\,yE^{(0,1)}[0,a]+$$
$$kE^2\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]^2\,yE[0,a]\,yE^{(0,1)}[0,a]+$$
$$4\,kE\,kI^6\,\beta\,\delta^2\,\epsilon^4\,yE[0,a]^2\,yE^{(0,1)}[0,a]-kE\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S\,yE[0,a]^2\,yE^{(0,1)}[0,a]-$$
$$2\,kE\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]\,yE[0,a]^2\,yE^{(0,1)}[0,a]+kI^6\,\beta^2\,\delta\,\epsilon^5\,yE[0,a]^3\,yE^{(0,1)}[0,a]+$$

$$
\begin{aligned}
&4\,kE^3\,kI^5\,\delta\,\epsilon^4\,\mu S\,yI[0,a]\,yE^{(0,1)}[0,a] - kE^3\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]^2\,yI[0,a]\,yE^{(0,1)}[0,a] - \\
&8\,kE^2\,kI^5\,\beta\,\delta\,\epsilon^4\,yE[0,a]\times yI[0,a]\,yE^{(0,1)}[0,a] + \\
&2\,kE^2\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]\times yE[0,a]\times yI[0,a]\,yE^{(0,1)}[0,a] - \\
&kE\,kI^5\,\beta^2\,\epsilon^5\,yE[0,a]^2\,yI[0,a]\,yE^{(0,1)}[0,a] + 4\,kE^3\,kI^4\,\beta\,\epsilon^4\,yI[0,a]^2\,yE^{(0,1)}[0,a] - \\
&kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a]\,yE^{(0,1)}[0,a] - \\
&kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,yE[0,a]\,Ntot^{(0,1)}[0,a]\,yE^{(0,1)}[0,a] + \\
&2\,kE^3\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,Ntot^{(0,1)}[0,a]\,yE^{(0,1)}[0,a] - kE^2\,kI^6\,\delta^2\,\epsilon^4\,yE^{(0,1)}[0,a]^2 + \\
&kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,Ntot[0,a]\,yE^{(0,1)}[0,a]^2 - kE^2\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,yE^{(0,1)}[0,a]^2 + \\
&kE^4\,kI^5\,\beta\,\epsilon^5\,\mu S\,Ntot[0,a]^2\,yI^{(0,1)}[0,a] + 4\,kE^3\,kI^5\,\delta\,\epsilon^4\,\mu S\,yE[0,a]\,yI^{(0,1)}[0,a] - \\
&2\,kE^3\,kI^5\,\beta\,\epsilon^5\,\mu S\,Ntot[0,a]\times yE[0,a]\,yI^{(0,1)}[0,a] + \\
&kE^2\,kI^5\,\beta\,\epsilon^5\,\mu S\,yE[0,a]^2\,yI^{(0,1)}[0,a] - 4\,kE^4\,kI^4\,\epsilon^4\,\mu S\,yI[0,a]\,yI^{(0,1)}[0,a] + \\
&kE^4\,kI^5\,\beta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a]\,yI^{(0,1)}[0,a] - \\
&kE^3\,kI^5\,\beta\,\epsilon^5\,yE[0,a]\,Ntot^{(0,1)}[0,a]\,yI^{(0,1)}[0,a] + 2\,kE^3\,kI^5\,\delta\,\epsilon^4\,yE^{(0,1)}[0,a] \\
&\quad yI^{(0,1)}[0,a] - kE^3\,kI^5\,\beta\,\epsilon^5\,Ntot[0,a]\,yE^{(0,1)}[0,a]\,yI^{(0,1)}[0,a] + \\
&kE^2\,kI^5\,\beta\,\epsilon^5\,yE[0,a]\,yE^{(0,1)}[0,a]\,yI^{(0,1)}[0,a] - kE^4\,kI^4\,\epsilon^4\,yI^{(0,1)}[0,a]^2 - \\
&kE^3\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]^2\,yE[0,a]\,Ntot^{(1,0)}[0,a] - 4\,kE^2\,kI^6\,\beta\,\delta^2\,\epsilon^4\,yE[0,a]^2 \\
&\quad Ntot^{(1,0)}[0,a] + 2\,kE^2\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]\,yE[0,a]^2\,Ntot^{(1,0)}[0,a] - \\
&kE\,kI^6\,\beta^2\,\delta\,\epsilon^5\,yE[0,a]^3\,Ntot^{(1,0)}[0,a] + kE^4\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]^2\,yI[0,a] \\
&\quad Ntot^{(1,0)}[0,a] + 8\,kE^3\,kI^5\,\beta\,\delta\,\epsilon^4\,yE[0,a]\times yI[0,a]\,Ntot^{(1,0)}[0,a] - \\
&2\,kE^3\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]\times yE[0,a]\times yI[0,a]\,Ntot^{(1,0)}[0,a] + \\
&kE^2\,kI^5\,\beta^2\,\epsilon^5\,yE[0,a]^2\,yI[0,a]\,Ntot^{(1,0)}[0,a] - 4\,kE^4\,kI^4\,\beta\,\epsilon^4\,yI[0,a]^2\,Ntot^{(1,0)}[0,a] + \\
&2\,kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,yE[0,a]\,Ntot^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] - \\
&2\,kE^4\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,Ntot^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] - \\
&kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,Ntot[0,a]\,yE^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] - \\
&kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,yE[0,a]\,yE^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] + \\
&2\,kE^3\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,yE^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] + \\
&kE^4\,kI^5\,\beta\,\epsilon^5\,Ntot[0,a]\,yI^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] - \\
&kE^3\,kI^5\,\beta\,\epsilon^5\,yE[0,a]\,yI^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] + \\
&kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,yE[0,a]\,Ntot^{(1,0)}[0,a]^2 - kE^4\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,Ntot^{(1,0)}[0,a]^2 - \\
&kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^2\,yE^{(1,0)}[0,a] - 4\,kE^2\,kI^6\,\delta^2\,\epsilon^4\,\mu S\,yE[0,a]\,yE^{(1,0)}[0,a] + \\
&2\,kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]\times yE[0,a]\,yE^{(1,0)}[0,a] + \\
&kE^2\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]^2\,yE[0,a]\,yE^{(1,0)}[0,a] + \\
&4\,kE\,kI^6\,\beta\,\delta^2\,\epsilon^4\,yE[0,a]^2\,yE^{(1,0)}[0,a] - kE\,kI^6\,\beta\,\delta\,\epsilon^5\,\mu S\,yE[0,a]^2\,yE^{(1,0)}[0,a] - \\
&2\,kE\,kI^6\,\beta^2\,\delta\,\epsilon^5\,Ntot[0,a]\,yE[0,a]^2\,yE^{(1,0)}[0,a] + kI^6\,\beta^2\,\delta\,\epsilon^5\,yE[0,a]^3\,yE^{(1,0)}[0,a] + \\
&4\,kE^3\,kI^5\,\delta\,\epsilon^4\,\mu S\,yI[0,a]\,yE^{(1,0)}[0,a] - kE^3\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]^2\,yI[0,a]\,yE^{(1,0)}[0,a] - \\
&8\,kE^2\,kI^5\,\beta\,\delta\,\epsilon^4\,yE[0,a]\times yI[0,a]\,yE^{(1,0)}[0,a] + \\
&2\,kE^2\,kI^5\,\beta^2\,\epsilon^5\,Ntot[0,a]\times yE[0,a]\times yI[0,a]\,yE^{(1,0)}[0,a] - \\
&kE\,kI^5\,\beta^2\,\epsilon^5\,yE[0,a]^2\,yI[0,a]\,yE^{(1,0)}[0,a] + 4\,kE^3\,kI^4\,\beta\,\epsilon^4\,yI[0,a]^2\,yE^{(1,0)}[0,a] - \\
&kE^3\,kI^6\,\beta\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] - \\
&kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,yE[0,a]\,Ntot^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] + \\
&2\,kE^3\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,Ntot^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] - \\
&2\,kE^2\,kI^6\,\delta^2\,\epsilon^4\,yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] + 2\,kE^2\,kI^6\,\beta\,\delta\,\epsilon^5\,Ntot[0,a] \\
&\quad yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] - 2\,kE^2\,kI^5\,\beta\,\epsilon^5\,yI[0,a]\,yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] + \\
&2\,kE^3\,kI^5\,\delta\,\epsilon^4\,yI^{(0,1)}[0,a]\,yE^{(1,0)}[0,a] - kE^3\,kI^5\,\beta\,\epsilon^5\,Ntot[0,a]\,yI^{(0,1)}[0,a]
\end{aligned}
$$

```
 yE^(1,0)[0, a] + kE^2 kI^5 β ϵ^5 yE[0, a] yI^(0,1)[0, a] yE^(1,0)[0, a] -
kE^3 kI^6 β δ ϵ^5 Ntot[0, a] Ntot^(1,0)[0, a] yE^(1,0)[0, a] -
kE^2 kI^6 β δ ϵ^5 yE[0, a] Ntot^(1,0)[0, a] yE^(1,0)[0, a] +
2 kE^3 kI^5 β ϵ^5 yI[0, a] Ntot^(1,0)[0, a] yE^(1,0)[0, a] - kE^2 kI^6 δ^2 ϵ^4 yE^(1,0)[0, a]^2 +
kE^2 kI^6 β δ ϵ^5 Ntot[0, a] yE^(1,0)[0, a]^2 - kE^2 kI^5 β ϵ^5 yI[0, a] yE^(1,0)[0, a]^2 +
kE^4 kI^5 β ϵ^5 μS Ntot[0, a]^2 yI^(1,0)[0, a] + 4 kE^3 kI^5 δ ϵ^4 μS yE[0, a] yI^(1,0)[0, a] -
2 kE^3 kI^5 β ϵ^5 μS Ntot[0, a] × yE[0, a] yI^(1,0)[0, a] +
kE^2 kI^5 β ϵ^5 μS yE[0, a]^2 yI^(1,0)[0, a] - 4 kE^4 kI^4 ϵ^4 μS yI[0, a] yI^(1,0)[0, a] +
kE^4 kI^5 β ϵ^5 Ntot[0, a] Ntot^(0,1)[0, a] yI^(1,0)[0, a] -
kE^3 kI^5 β ϵ^5 yE[0, a] Ntot^(0,1)[0, a] yI^(1,0)[0, a] + 2 kE^3 kI^5 δ ϵ^4 yE^(0,1)[0, a]
 yI^(1,0)[0, a] - kE^3 kI^5 β ϵ^5 Ntot[0, a] yE^(0,1)[0, a] yI^(1,0)[0, a] +
kE^2 kI^5 β ϵ^5 yE[0, a] yE^(0,1)[0, a] yI^(1,0)[0, a] - 2 kE^4 kI^4 ϵ^4 yI^(0,1)[0, a] yI^(1,0)[0, a] +
kE^4 kI^5 β ϵ^5 Ntot[0, a] Ntot^(1,0)[0, a] yI^(1,0)[0, a] -
kE^3 kI^5 β ϵ^5 yE[0, a] Ntot^(1,0)[0, a] yI^(1,0)[0, a] + 2 kE^3 kI^5 δ ϵ^4 yE^(1,0)[0, a]
 yI^(1,0)[0, a] - kE^3 kI^5 β ϵ^5 Ntot[0, a] yE^(1,0)[0, a] yI^(1,0)[0, a] +
kE^2 kI^5 β ϵ^5 yE[0, a] yE^(1,0)[0, a] yI^(1,0)[0, a] - kE^4 kI^4 ϵ^4 yI^(1,0)[0, a]^2)
```

Out[•]=

```
16 (kI^4 β^4 δ^2 ϵ^2 yE[0, a]^2 + 2 kI^4 β^4 δ ϵ^3 μE yE[0, a]^2 +
kI^4 β^4 ϵ^4 μE^2 yE[0, a]^2 - 2 kE kI^3 β^4 δ ϵ^2 yE[0, a] × yI[0, a] +
2 kE kI^3 β^4 δ ϵ^3 yE[0, a] × yI[0, a] - 2 kE kI^3 β^4 ϵ^3 μE yE[0, a] × yI[0, a] +
2 kE kI^3 β^4 ϵ^4 μE yE[0, a] × yI[0, a] + kE^2 kI^2 β^4 ϵ^2 yI[0, a]^2 -
2 kE^2 kI^2 β^4 ϵ^3 yI[0, a]^2 + kE^2 kI^2 β^4 ϵ^4 yI[0, a]^2 + 2 kI^4 β^4 δ ϵ^3 yE[0, a] yE^(0,1)[0, a] +
2 kI^4 β^4 ϵ^4 μE yE[0, a] yE^(0,1)[0, a] - 2 kE kI^3 β^4 ϵ^3 yI[0, a] yE^(0,1)[0, a] +
2 kE kI^3 β^4 ϵ^4 yI[0, a] yE^(0,1)[0, a] + kI^4 β^4 ϵ^4 yE^(0,1)[0, a]^2 +
2 kI^4 β^4 δ ϵ^3 yE[0, a] yE^(1,0)[0, a] + 2 kI^4 β^4 ϵ^4 μE yE[0, a] yE^(1,0)[0, a] -
2 kE kI^3 β^4 ϵ^3 yI[0, a] yE^(1,0)[0, a] + 2 kE kI^3 β^4 ϵ^4 yI[0, a] yE^(1,0)[0, a] +
2 kI^4 β^4 ϵ^4 yE^(0,1)[0, a] yE^(1,0)[0, a] + kI^4 β^4 ϵ^4 yE^(1,0)[0, a]^2)
```

Out[•]=

```
64 β^4 ϵ^4 (kE^2 kI^6 β δ ϵ μI^2 Ntot[0, a]^2 yE[0, a] + 4 kE kI^6 δ^2 μI^2 yE[0, a]^2 -
2 kE kI^6 β δ ϵ μI^2 Ntot[0, a] yE[0, a]^2 + kI^6 β δ ϵ μI^2 yE[0, a]^3 -
kE^3 kI^5 β ϵ μI^2 Ntot[0, a]^2 yI[0, a] + kE^3 kI^5 β^2 ϵ^2 μI Ntot[0, a]^3 yI[0, a] -
8 kE^2 kI^5 δ μI^2 yE[0, a] × yI[0, a] + 4 kE^2 kI^5 β δ ϵ μI Ntot[0, a] × yE[0, a] × yI[0, a] +
2 kE^2 kI^5 β ϵ μI^2 Ntot[0, a] × yE[0, a] × yI[0, a] -
3 kE^2 kI^5 β^2 ϵ^2 μI Ntot[0, a]^2 yE[0, a] × yI[0, a] - 4 kE kI^5 β δ ϵ μI yE[0, a]^2 yI[0, a] -
kE kI^5 β ϵ μI^2 yE[0, a]^2 yI[0, a] + 3 kE kI^5 β^2 ϵ^2 μI Ntot[0, a] yE[0, a]^2 yI[0, a] -
kI^5 β^2 ϵ^2 μI yE[0, a]^3 yI[0, a] + 4 kE^3 kI^4 μI^2 yI[0, a]^2 -
4 kE^3 kI^4 β ϵ μI Ntot[0, a] yI[0, a]^2 - kE^3 kI^4 β^2 ϵ^2 Ntot[0, a]^2 yI[0, a]^2 -
4 kE^2 kI^4 β δ ϵ yE[0, a] yI[0, a]^2 + 4 kE^2 kI^4 β ϵ μI yE[0, a] yI[0, a]^2 +
2 kE^2 kI^4 β^2 ϵ^2 Ntot[0, a] × yE[0, a] yI[0, a]^2 - kE kI^4 β^2 ϵ^2 yE[0, a]^2 yI[0, a]^2 +
4 kE^3 kI^3 β ϵ yI[0, a]^3 + kE^3 kI^5 β^2 ϵ^2 Ntot[0, a]^2 yI[0, a] Ntot^(0,1)[0, a] +
4 kE^2 kI^5 β δ ϵ yE[0, a] × yI[0, a] Ntot^(0,1)[0, a] -
2 kE^2 kI^5 β^2 ϵ^2 Ntot[0, a] × yE[0, a] × yI[0, a] Ntot^(0,1)[0, a] +
kE kI^5 β^2 ϵ^2 yE[0, a]^2 yI[0, a] Ntot^(0,1)[0, a] - 4 kE^3 kI^4 β ϵ yI[0, a]^2 Ntot^(0,1)[0, a] -
kE^2 kI^6 β δ ϵ yE[0, a] Ntot^(0,1)[0, a]^2 + kE^3 kI^5 β ϵ yI[0, a] Ntot^(0,1)[0, a]^2 +
```

```
kE^2 kI^6 β δ ϵ μI Ntot[0, a]^2 yE^(0,1) [0, a] + 4 kE kI^6 δ^2 μI yE[0, a] yE^(0,1) [0, a] -
2 kE kI^6 β δ ϵ μI Ntot[0, a] × yE[0, a] yE^(0,1) [0, a] + kI^6 β δ ϵ μI yE[0, a]^2 yE^(0,1) [0, a] -
4 kE^2 kI^5 δ μI yI[0, a] yE^(0,1) [0, a] - kE^2 kI^5 β^2 ϵ^2 Ntot[0, a]^2 yI[0, a] yE^(0,1) [0, a] -
4 kE kI^5 β δ ϵ yE[0, a] × yI[0, a] yE^(0,1) [0, a] +
2 kE kI^5 β^2 ϵ^2 Ntot[0, a] × yE[0, a] × yI[0, a] yE^(0,1) [0, a] -
kI^5 β^2 ϵ^2 yE[0, a]^2 yI[0, a] yE^(0,1) [0, a] + 4 kE^2 kI^4 β ϵ yI[0, a]^2 yE^(0,1) [0, a] +
kE^2 kI^6 β δ ϵ Ntot[0, a] Ntot^(0,1) [0, a] yE^(0,1) [0, a] +
kE kI^6 β δ ϵ yE[0, a] Ntot^(0,1) [0, a] yE^(0,1) [0, a] -
2 kE^2 kI^5 β ϵ yI[0, a] Ntot^(0,1) [0, a] yE^(0,1) [0, a] + kE kI^6 δ^2 yE^(0,1) [0, a]^2 -
kE kI^6 β δ ϵ Ntot[0, a] yE^(0,1) [0, a]^2 + kE kI^5 β ϵ yI[0, a] yE^(0,1) [0, a]^2 -
kE^3 kI^5 β ϵ μI Ntot[0, a]^2 yI^(0,1) [0, a] - 4 kE^2 kI^5 δ μI yE[0, a] yI^(0,1) [0, a] +
2 kE^2 kI^5 β ϵ μI Ntot[0, a] × yE[0, a] yI^(0,1) [0, a] - kE kI^5 β ϵ μI yE[0, a]^2 yI^(0,1) [0, a] +
4 kE^3 kI^4 μI yI[0, a] yI^(0,1) [0, a] - kE^3 kI^5 β ϵ Ntot[0, a] Ntot^(0,1) [0, a] yI^(0,1) [0, a] +
kE^2 kI^5 β ϵ yE[0, a] Ntot^(0,1) [0, a] yI^(0,1) [0, a] -
2 kE^2 kI^5 δ yE^(0,1) [0, a] yI^(0,1) [0, a] + kE^2 kI^5 β ϵ Ntot[0, a] yE^(0,1) [0, a] yI^(0,1) [0, a] -
kE kI^5 β ϵ yE[0, a] yE^(0,1) [0, a] yI^(0,1) [0, a] + kE^3 kI^4 yI^(0,1) [0, a]^2 +
kE^3 kI^5 β^2 ϵ^2 Ntot[0, a]^2 yI[0, a] Ntot^(1,0) [0, a] +
4 kE^2 kI^5 β δ ϵ yE[0, a] × yI[0, a] Ntot^(1,0) [0, a] -
2 kE^2 kI^5 β^2 ϵ^2 Ntot[0, a] × yE[0, a] × yI[0, a] Ntot^(1,0) [0, a] +
kE kI^5 β^2 ϵ^2 yE[0, a]^2 yI[0, a] Ntot^(1,0) [0, a] - 4 kE^3 kI^4 β ϵ yI[0, a]^2 Ntot^(1,0) [0, a] -
2 kE^2 kI^6 β δ ϵ yE[0, a] Ntot^(0,1) [0, a] Ntot^(1,0) [0, a] +
2 kE^3 kI^5 β ϵ yI[0, a] Ntot^(0,1) [0, a] Ntot^(1,0) [0, a] +
kE^2 kI^6 β δ ϵ Ntot[0, a] yE^(0,1) [0, a] Ntot^(1,0) [0, a] +
kE kI^6 β δ ϵ yE[0, a] yE^(0,1) [0, a] Ntot^(1,0) [0, a] -
2 kE^2 kI^5 β ϵ yI[0, a] yE^(0,1) [0, a] Ntot^(1,0) [0, a] -
kE^3 kI^5 β ϵ Ntot[0, a] yI^(0,1) [0, a] Ntot^(1,0) [0, a] +
kE^2 kI^5 β ϵ yE[0, a] yI^(0,1) [0, a] Ntot^(1,0) [0, a] -
kE^2 kI^6 β δ ϵ yE[0, a] Ntot^(1,0) [0, a]^2 + kE^3 kI^5 β ϵ yI[0, a] Ntot^(1,0) [0, a]^2 +
kE^2 kI^6 β δ ϵ μI Ntot[0, a]^2 yE^(1,0) [0, a] + 4 kE kI^6 δ^2 μI yE[0, a] yE^(1,0) [0, a] -
2 kE kI^6 β δ ϵ μI Ntot[0, a] × yE[0, a] yE^(1,0) [0, a] + kI^6 β δ ϵ μI yE[0, a]^2 yE^(1,0) [0, a] -
4 kE^2 kI^5 δ μI yI[0, a] yE^(1,0) [0, a] - kE^2 kI^5 β^2 ϵ^2 Ntot[0, a]^2 yI[0, a] yE^(1,0) [0, a] -
4 kE kI^5 β δ ϵ yE[0, a] × yI[0, a] yE^(1,0) [0, a] +
2 kE kI^5 β^2 ϵ^2 Ntot[0, a] × yE[0, a] × yI[0, a] yE^(1,0) [0, a] -
kI^5 β^2 ϵ^2 yE[0, a]^2 yI[0, a] yE^(1,0) [0, a] + 4 kE^2 kI^4 β ϵ yI[0, a]^2 yE^(1,0) [0, a] +
kE^2 kI^6 β δ ϵ Ntot[0, a] Ntot^(0,1) [0, a] yE^(1,0) [0, a] +
kE kI^6 β δ ϵ yE[0, a] Ntot^(0,1) [0, a] yE^(1,0) [0, a] -
2 kE^2 kI^5 β ϵ yI[0, a] Ntot^(0,1) [0, a] yE^(1,0) [0, a] + 2 kE kI^6 δ^2 yE^(0,1) [0, a] yE^(1,0) [0, a] -
2 kE kI^6 β δ ϵ Ntot[0, a] yE^(0,1) [0, a] yE^(1,0) [0, a] +
2 kE kI^5 β ϵ yI[0, a] yE^(0,1) [0, a] yE^(1,0) [0, a] - 2 kE^2 kI^5 δ yI^(0,1) [0, a] yE^(1,0) [0, a] +
kE^2 kI^5 β ϵ Ntot[0, a] yI^(0,1) [0, a] yE^(1,0) [0, a] -
kE kI^5 β ϵ yE[0, a] yI^(0,1) [0, a] yE^(1,0) [0, a] +
kE^2 kI^6 β δ ϵ Ntot[0, a] Ntot^(1,0) [0, a] yE^(1,0) [0, a] +
kE kI^6 β δ ϵ yE[0, a] Ntot^(1,0) [0, a] yE^(1,0) [0, a] -
2 kE^2 kI^5 β ϵ yI[0, a] Ntot^(1,0) [0, a] yE^(1,0) [0, a] + kE kI^6 δ^2 yE^(1,0) [0, a]^2 -
```

```
kE kI^6 β δ ϵ Ntot[0, a] yE^(1,0)[0, a]^2 + kE kI^5 β ϵ yI[0, a] yE^(1,0)[0, a]^2 -
kE^3 kI^5 β ϵ μI Ntot[0, a]^2 yI^(1,0)[0, a] - 4 kE^2 kI^5 δ μI yE[0, a] yI^(1,0)[0, a] +
2 kE^2 kI^5 β ϵ μI Ntot[0, a] × yE[0, a] yI^(1,0)[0, a] - kE kI^5 β ϵ μI yE[0, a]^2 yI^(1,0)[0, a] +
4 kE^3 kI^4 μI yI[0, a] yI^(1,0)[0, a] - kE^3 kI^5 β ϵ Ntot[0, a] Ntot^(0,1)[0, a] yI^(1,0)[0, a] +
kE^2 kI^5 β ϵ yE[0, a] Ntot^(0,1)[0, a] yI^(1,0)[0, a] -
2 kE^2 kI^5 δ yE^(0,1)[0, a] yI^(1,0)[0, a] + kE^2 kI^5 β ϵ Ntot[0, a] yE^(0,1)[0, a] yI^(1,0)[0, a] -
kE kI^5 β ϵ yE[0, a] yE^(0,1)[0, a] yI^(1,0)[0, a] + 2 kE^3 kI^4 yI^(0,1)[0, a] yI^(1,0)[0, a] -
kE^3 kI^5 β ϵ Ntot[0, a] Ntot^(1,0)[0, a] yI^(1,0)[0, a] +
kE^2 kI^5 β ϵ yE[0, a] Ntot^(1,0)[0, a] yI^(1,0)[0, a] -
2 kE^2 kI^5 δ yE^(1,0)[0, a] yI^(1,0)[0, a] + kE^2 kI^5 β ϵ Ntot[0, a] yE^(1,0)[0, a] yI^(1,0)[0, a] -
kE kI^5 β ϵ yE[0, a] yE^(1,0)[0, a] yI^(1,0)[0, a] + kE^3 kI^4 yI^(1,0)[0, a]^2)
```

In[∘]:=
```
Monos1 = Sort[MonomialList[IPOPish1[a], {yI[0, a], yE[0, a],
    (D[yI[t, a], t] /. t → 0), (D[yI[t, a], a] /. t → 0), (D[yI[t, a], t, a] /. t → 0),
    (D[yI[t, a], {t, 2}] /. t → 0), (D[yI[t, a], {a, 2}] /. t → 0),
    (D[yE[t, a], t] /. t → 0), (D[yE[t, a], a] /. t → 0), (D[yE[t, a], t, a] /. t → 0),
    (D[yE[t, a], {t, 2}] /. t → 0), (D[yE[t, a], {a, 2}] /. t → 0)}]]
Monos2 = Sort[MonomialList[IPOPish2[a], {yI[0, a], yE[0, a],
    (D[yI[t, a], t] /. t → 0), (D[yI[t, a], a] /. t → 0), (D[yI[t, a], t, a] /. t → 0),
    (D[yI[t, a], {t, 2}] /. t → 0), (D[yI[t, a], {a, 2}] /. t → 0),
    (D[yE[t, a], t] /. t → 0), (D[yE[t, a], a] /. t → 0), (D[yE[t, a], t, a] /. t → 0),
    (D[yE[t, a], {t, 2}] /. t → 0), (D[yE[t, a], {a, 2}] /. t → 0)}]]
```

Out[∘]=
```
{(-64 kI^6 β^6 δ^2 ϵ^4 - 64 kI^6 β^6 δ ϵ^5 μS) yE[0, a]^4,
 (128 kE kI^5 β^6 δ ϵ^4 + 64 kE kI^5 β^6 ϵ^5 μS) yE[0, a]^3 yI[0, a],
 (-768 kE^3 kI^4 β^5 δ ϵ^3 - 256 kE^3 kI^4 β^5 ϵ^4 μS + 128 kE^3 kI^4 β^6 ϵ^4 Ntot[0, a]) yE[0, a] yI[0, a]^2,
 -64 kE^2 kI^4 β^6 ϵ^4 yE[0, a]^2 yI[0, a]^2, 256 kE^4 kI^3 β^5 ϵ^3 yI[0, a]^3,
 (-256 kE kI^6 β^5 δ^2 ϵ^4 + 64 kE kI^6 β^5 δ ϵ^5 μS + 128 kE kI^6 β^6 δ ϵ^5 Ntot[0, a])
  yE[0, a]^2 yE^(0,1)[0, a], -64 kI^6 β^6 δ ϵ^5 yE[0, a]^3 yE^(0,1)[0, a],
 (512 kE^2 kI^5 β^5 δ ϵ^4 - 128 kE^2 kI^5 β^6 ϵ^5 Ntot[0, a]) yE[0, a] × yI[0, a] yE^(0,1)[0, a],
 64 kE kI^5 β^6 ϵ^5 yE[0, a]^2 yI[0, a] yE^(0,1)[0, a], -256 kE^3 kI^4 β^5 ϵ^4 yI[0, a]^2 yE^(0,1)[0, a],
 (64 kE^2 kI^6 β^4 δ^2 ϵ^4 - 64 kE^2 kI^6 β^5 δ ϵ^5 Ntot[0, a]) yE^(0,1)[0, a]^2,
 64 kE^2 kI^5 β^5 ϵ^5 yI[0, a] yE^(0,1)[0, a]^2, -64 kE^2 kI^5 β^5 ϵ^5 μS yE[0, a]^2 yI^(0,1)[0, a],
 256 kE^4 kI^4 β^4 ϵ^4 μS yI[0, a] yI^(0,1)[0, a],
 (-128 kE^3 kI^5 β^4 δ ϵ^4 + 64 kE^3 kI^5 β^5 ϵ^5 Ntot[0, a]) yE^(0,1)[0, a] yI^(0,1)[0, a],
 -64 kE^2 kI^5 β^5 ϵ^5 yE[0, a] yE^(0,1)[0, a] yI^(0,1)[0, a],
 64 kE^4 kI^4 β^4 ϵ^4 yI^(0,1)[0, a]^2, yI[0, a]^2
  (256 kE^4 kI^4 β^4 ϵ^4 μS^2 + 256 kE^4 kI^4 β^5 ϵ^4 μS Ntot[0, a] - 64 kE^4 kI^4 β^6 ϵ^4 Ntot[0, a]^2 +
     256 kE^4 kI^4 β^5 ϵ^4 Ntot^(0,1)[0, a] + 256 kE^4 kI^4 β^5 ϵ^4 Ntot^(1,0)[0, a]),
 yI[0, a] yE^(0,1)[0, a] (-256 kE^3 kI^5 β^4 δ ϵ^4 μS + 64 kE^3 kI^5 β^6 ϵ^5 Ntot[0, a]^2 -
     128 kE^3 kI^5 β^5 ϵ^5 Ntot^(0,1)[0, a] - 128 kE^3 kI^5 β^5 ϵ^5 Ntot^(1,0)[0, a]),
 yE[0, a] yI^(0,1)[0, a] (-256 kE^3 kI^5 β^4 δ ϵ^4 μS + 128 kE^3 kI^5 β^5 ϵ^5 μS Ntot[0, a] +
     64 kE^3 kI^5 β^5 ϵ^5 Ntot^(0,1)[0, a] + 64 kE^3 kI^5 β^5 ϵ^5 Ntot^(1,0)[0, a]),
```

```
yE[0, a]^2 yI[0, a] (768 kE^2 kI^5 β^5 δ^2 ϵ^3 + 512 kE^2 kI^5 β^5 δ ϵ^4 μS - 64 kE^2 kI^5 β^5 ϵ^5 μS^2 -
    256 kE^2 kI^5 β^6 δ ϵ^4 Ntot[0, a] - 192 kE^2 kI^5 β^6 ϵ^5 μS Ntot[0, a] -
    64 kE^2 kI^5 β^6 ϵ^5 Ntot^(0,1) [0, a] - 64 kE^2 kI^5 β^6 ϵ^5 Ntot^(1,0) [0, a]), yE[0, a] yE^(0,1) [0, a]
  (256 kE^2 kI^6 β^4 δ^2 ϵ^4 μS - 128 kE^2 kI^6 β^5 δ ϵ^5 μS Ntot[0, a] - 64 kE^2 kI^6 β^6 δ ϵ^5 Ntot[0, a]^2 +
    64 kE^2 kI^6 β^5 δ ϵ^5 Ntot^(0,1) [0, a] + 64 kE^2 kI^6 β^5 δ ϵ^5 Ntot^(1,0) [0, a]),
yE[0, a]^3 (-256 kE kI^6 β^5 δ^3 ϵ^3 - 256 kE kI^6 β^5 δ^2 ϵ^4 μS + 64 kE kI^6 β^5 δ ϵ^5 μS^2 +
    128 kE kI^6 β^6 δ^2 ϵ^4 Ntot[0, a] + 192 kE kI^6 β^6 δ ϵ^5 μS Ntot[0, a] +
    64 kE kI^6 β^6 δ ϵ^5 Ntot^(0,1) [0, a] + 64 kE kI^6 β^6 δ ϵ^5 Ntot^(1,0) [0, a]),
yI^(0,1) [0, a] (-64 kE^4 kI^5 β^5 ϵ^5 μS Ntot[0, a]^2 - 64 kE^4 kI^5 β^5 ϵ^5 Ntot[0, a] Ntot^(0,1) [0, a] -
    64 kE^4 kI^5 β^5 ϵ^5 Ntot[0, a] Ntot^(1,0) [0, a]),
yE[0, a] × yI[0, a] (-512 kE^3 kI^5 β^4 δ ϵ^4 μS^2 - 512 kE^3 kI^5 β^5 δ ϵ^4 μS Ntot[0, a] + 128 kE^3 kI^5
     β^5 ϵ^5 μS^2 Ntot[0, a] + 128 kE^3 kI^5 β^6 δ ϵ^4 Ntot[0, a]^2 + 192 kE^3 kI^5 β^6 ϵ^5 μS Ntot[0, a]^2 -
    512 kE^3 kI^5 β^5 δ ϵ^4 Ntot^(0,1) [0, a] + 128 kE^3 kI^5 β^6 ϵ^5 Ntot[0, a] Ntot^(0,1) [0, a] -
    512 kE^3 kI^5 β^5 δ ϵ^4 Ntot^(1,0) [0, a] + 128 kE^3 kI^5 β^6 ϵ^5 Ntot[0, a] Ntot^(1,0) [0, a]),
yE^(0,1) [0, a] (64 kE^3 kI^6 β^5 δ ϵ^5 μS Ntot[0, a]^2 + 64 kE^3 kI^6 β^5 δ ϵ^5 Ntot[0, a] Ntot^(0,1) [0, a] +
    64 kE^3 kI^6 β^5 δ ϵ^5 Ntot[0, a] Ntot^(1,0) [0, a]),
yE[0, a]^2 (256 kE^2 kI^6 β^4 δ^2 ϵ^4 μS^2 + 256 kE^2 kI^6 β^5 δ^2 ϵ^4 μS Ntot[0, a] - 128 kE^2 kI^6 β^5 δ
     ϵ^5 μS^2 Ntot[0, a] - 64 kE^2 kI^6 β^6 δ^2 ϵ^4 Ntot[0, a]^2 - 192 kE^2 kI^6 β^6 δ ϵ^5 μS Ntot[0, a]^2 +
    256 kE^2 kI^6 β^5 δ^2 ϵ^4 Ntot^(0,1) [0, a] - 128 kE^2 kI^6 β^6 δ ϵ^5 Ntot[0, a] Ntot^(0,1) [0, a] +
    256 kE^2 kI^6 β^5 δ^2 ϵ^4 Ntot^(1,0) [0, a] - 128 kE^2 kI^6 β^6 δ ϵ^5 Ntot[0, a] Ntot^(1,0) [0, a]),
yI[0, a] (-64 kE^4 kI^5 β^5 ϵ^5 μS^2 Ntot[0, a]^2 - 64 kE^4 kI^5 β^6 ϵ^5 μS Ntot[0, a]^3 -
    64 kE^4 kI^5 β^6 ϵ^5 Ntot[0, a]^2 Ntot^(0,1) [0, a] +
    64 kE^4 kI^5 β^5 ϵ^5 Ntot^(0,1) [0, a]^2 - 64 kE^4 kI^5 β^6 ϵ^5 Ntot[0, a]^2 Ntot^(1,0) [0, a] +
    128 kE^4 kI^5 β^5 ϵ^5 Ntot^(0,1) [0, a] Ntot^(1,0) [0, a] + 64 kE^4 kI^5 β^5 ϵ^5 Ntot^(1,0) [0, a]^2),
yE[0, a] (64 kE^3 kI^6 β^5 δ ϵ^5 μS^2 Ntot[0, a]^2 + 64 kE^3 kI^6 β^6 δ ϵ^5 μS Ntot[0, a]^3 +
    64 kE^3 kI^6 β^6 δ ϵ^5 Ntot[0, a]^2 Ntot^(0,1) [0, a] -
    64 kE^3 kI^6 β^5 δ ϵ^5 Ntot^(0,1) [0, a]^2 + 64 kE^3 kI^6 β^6 δ ϵ^5 Ntot[0, a]^2 Ntot^(1,0) [0, a] -
    128 kE^3 kI^6 β^5 δ ϵ^5 Ntot^(0,1) [0, a] Ntot^(1,0) [0, a] - 64 kE^3 kI^6 β^5 δ ϵ^5 Ntot^(1,0) [0, a]^2),
(-256 kE kI^6 β^5 δ^2 ϵ^4 + 64 kE kI^6 β^5 δ ϵ^5 μS + 128 kE kI^6 β^6 δ ϵ^5 Ntot[0, a])
  yE[0, a]^2 yE^(1,0) [0, a], -64 kI^6 β^6 δ ϵ^5 yE[0, a]^3 yE^(1,0) [0, a],
(512 kE^2 kI^5 β^5 δ ϵ^4 - 128 kE^2 kI^5 β^6 ϵ^5 Ntot[0, a]) yE[0, a] × yI[0, a] yE^(1,0) [0, a],
64 kE kI^5 β^6 ϵ^5 yE[0, a]^2 yI[0, a] yE^(1,0) [0, a],
-256 kE^3 kI^4 β^5 ϵ^4 yI[0, a]^2 yE^(1,0) [0, a],
(128 kE^2 kI^6 β^4 δ^2 ϵ^4 - 128 kE^2 kI^6 β^5 δ ϵ^5 Ntot[0, a]) yE^(0,1) [0, a] yE^(1,0) [0, a],
128 kE^2 kI^5 β^5 ϵ^5 yI[0, a] yE^(0,1) [0, a] yE^(1,0) [0, a],
(-128 kE^3 kI^5 β^4 δ ϵ^4 + 64 kE^3 kI^5 β^5 ϵ^5 Ntot[0, a]) yI^(0,1) [0, a] yE^(1,0) [0, a],
-64 kE^2 kI^5 β^5 ϵ^5 yE[0, a] yI^(0,1) [0, a] yE^(1,0) [0, a], yI[0, a]
  (-256 kE^3 kI^5 β^4 δ ϵ^4 μS + 64 kE^3 kI^5 β^6 ϵ^5 Ntot[0, a]^2 - 128 kE^3 kI^5 β^5 ϵ^5 Ntot^(0,1) [0, a] -
    128 kE^3 kI^5 β^5 ϵ^5 Ntot^(1,0) [0, a]) yE^(1,0) [0, a], yE[0, a]
  (256 kE^2 kI^6 β^4 δ^2 ϵ^4 μS - 128 kE^2 kI^6 β^5 δ ϵ^5 μS Ntot[0, a] - 64 kE^2 kI^6 β^6 δ ϵ^5 Ntot[0, a]^2 +
    64 kE^2 kI^6 β^5 δ ϵ^5 Ntot^(0,1) [0, a] + 64 kE^2 kI^6 β^5 δ ϵ^5 Ntot^(1,0) [0, a]) yE^(1,0) [0, a],
```

```
(64 kE^3 kI^6 β^5 δ ϵ^5 μS Ntot[0, a]^2 + 64 kE^3 kI^6 β^5 δ ϵ^5 Ntot[0, a] Ntot^(0,1)[0, a] +
    64 kE^3 kI^6 β^5 δ ϵ^5 Ntot[0, a] Ntot^(1,0)[0, a]) yE^(1,0)[0, a],
(64 kE^2 kI^6 β^4 δ^2 ϵ^4 - 64 kE^2 kI^6 β^5 δ ϵ^5 Ntot[0, a]) yE^(1,0)[0, a]^2,
64 kE^2 kI^5 β^5 ϵ^5 yI[0, a] yE^(1,0)[0, a]^2,
-64 kE^2 kI^5 β^5 ϵ^5 μS yE[0, a]^2 yI^(1,0)[0, a],
256 kE^4 kI^4 β^4 ϵ^4 μS yI[0, a] yI^(1,0)[0, a],
(-128 kE^3 kI^5 β^4 δ ϵ^4 + 64 kE^3 kI^5 β^5 ϵ^5 Ntot[0, a]) yE^(0,1)[0, a] yI^(1,0)[0, a],
-64 kE^2 kI^5 β^5 ϵ^5 yE[0, a] yE^(0,1)[0, a] yI^(1,0)[0, a],
128 kE^4 kI^4 β^4 ϵ^4 yI^(0,1)[0, a] yI^(1,0)[0, a],
yE[0, a] (-256 kE^3 kI^5 β^4 δ ϵ^4 μS + 128 kE^3 kI^5 β^5 ϵ^5 μS Ntot[0, a] +
    64 kE^3 kI^5 β^5 ϵ^5 Ntot^(0,1)[0, a] + 64 kE^3 kI^5 β^5 ϵ^5 Ntot^(1,0)[0, a]) yI^(1,0)[0, a],
(-64 kE^4 kI^5 β^5 ϵ^5 μS Ntot[0, a]^2 - 64 kE^4 kI^5 β^5 ϵ^5 Ntot[0, a] Ntot^(0,1)[0, a] -
    64 kE^4 kI^5 β^5 ϵ^5 Ntot[0, a] Ntot^(1,0)[0, a]) yI^(1,0)[0, a],
(-128 kE^3 kI^5 β^4 δ ϵ^4 + 64 kE^3 kI^5 β^5 ϵ^5 Ntot[0, a]) yE^(1,0)[0, a] yI^(1,0)[0, a],
-64 kE^2 kI^5 β^5 ϵ^5 yE[0, a] yE^(1,0)[0, a] yI^(1,0)[0, a],
64 kE^4 kI^4 β^4 ϵ^4 yI^(1,0)[0, a]^2}
```

Out[•]=
```
{(16 kI^4 β^4 δ^2 ϵ^2 + 32 kI^4 β^4 δ ϵ^3 μE + 16 kI^4 β^4 ϵ^4 μE^2) yE[0, a]^2,
(-32 kE kI^3 β^4 δ ϵ^2 + 32 kE kI^3 β^4 δ ϵ^3 - 32 kE kI^3 β^4 ϵ^3 μE + 32 kE kI^3 β^4 ϵ^4 μE)
 yE[0, a] × yI[0, a], (16 kE^2 kI^2 β^4 ϵ^2 - 32 kE^2 kI^2 β^4 ϵ^3 + 16 kE^2 kI^2 β^4 ϵ^4) yI[0, a]^2,
(32 kI^4 β^4 δ ϵ^3 + 32 kI^4 β^4 ϵ^4 μE) yE[0, a] yE^(0,1)[0, a],
(-32 kE kI^3 β^4 ϵ^3 + 32 kE kI^3 β^4 ϵ^4) yI[0, a] yE^(0,1)[0, a],
16 kI^4 β^4 ϵ^4 yE^(0,1)[0, a]^2, (32 kI^4 β^4 δ ϵ^3 + 32 kI^4 β^4 ϵ^4 μE) yE[0, a] yE^(1,0)[0, a],
(-32 kE kI^3 β^4 ϵ^3 + 32 kE kI^3 β^4 ϵ^4) yI[0, a] yE^(1,0)[0, a],
32 kI^4 β^4 ϵ^4 yE^(0,1)[0, a] yE^(1,0)[0, a], 16 kI^4 β^4 ϵ^4 yE^(1,0)[0, a]^2}
```

In[•]:=
```
MonicMonos1 =
 Monos1 / (Last[Monos1] /. {yI[0, a] → 1, yE[0, a] → 1, (D[yI[t, a], t] /. t → 0) → 1,
     (D[yI[t, a], a] /. t → 0) → 1, (D[yI[t, a], t, a] /. t → 0) → 1,
     (D[yI[t, a], {t, 2}] /. t → 0) → 1, (D[yI[t, a], {a, 2}] /. t → 0) → 1,
     (D[yE[t, a], t] /. t → 0) → 1, (D[yE[t, a], a] /. t → 0) → 1,
     (D[yE[t, a], t, a] /. t → 0) → 1, (D[yE[t, a], {t, 2}] /. t → 0) → 1,
     (D[yE[t, a], {a, 2}] /. t → 0) → 1})
MonicMonos2 = Monos2 / (Last[Monos2] /. {yI[0, a] → 1, yE[0, a] → 1,
     (D[yI[t, a], t] /. t → 0) → 1, (D[yI[t, a], a] /. t → 0) → 1,
     (D[yI[t, a], t, a] /. t → 0) → 1, (D[yI[t, a], {t, 2}] /. t → 0) → 1,
     (D[yI[t, a], {a, 2}] /. t → 0) → 1, (D[yE[t, a], t] /. t → 0) → 1,
     (D[yE[t, a], a] /. t → 0) → 1, (D[yE[t, a], t, a] /. t → 0) → 1,
     (D[yE[t, a], {t, 2}] /. t → 0) → 1, (D[yE[t, a], {a, 2}] /. t → 0) → 1})
```

Out[•]=
```
{(-64 kI^6 β^6 δ^2 ϵ^4 - 64 kI^6 β^6 δ ϵ^5 μS) yE[0, a]^4 / (64 kE^4 kI^4 β^4 ϵ^4),
```

$$\frac{\left(128\,kE\,kI^5\,\beta^6\,\delta\,\epsilon^4+64\,kE\,kI^5\,\beta^6\,\epsilon^5\,\mu S\right)\,yE[0,a]^3\,yI[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{\left(-768\,kE^3\,kI^4\,\beta^5\,\delta\,\epsilon^3-256\,kE^3\,kI^4\,\beta^5\,\epsilon^4\,\mu S+128\,kE^3\,kI^4\,\beta^6\,\epsilon^4\,Ntot[0,a]\right)\,yE[0,a]\,yI[0,a]^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{\beta^2\,yE[0,a]^2\,yI[0,a]^2}{kE^2},\ \frac{4\,\beta\,yI[0,a]^3}{kI\,\epsilon},\ \frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}$$

$$\left(-256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4+64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S+128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]\right)$$

$$yE[0,a]^2\,yE^{(0,1)}[0,a],\ -\frac{kI^2\,\beta^2\,\delta\,\epsilon\,yE[0,a]^3\,yE^{(0,1)}[0,a]}{kE^4},$$

$$\frac{\left(512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4-128\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]\right)\,yE[0,a]\times yI[0,a]\,yE^{(0,1)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{kI\,\beta^2\,\epsilon\,yE[0,a]^2\,yI[0,a]\,yE^{(0,1)}[0,a]}{kE^3},\ -\frac{4\,\beta\,yI[0,a]^2\,yE^{(0,1)}[0,a]}{kE},$$

$$\frac{\left(64\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\right)\,yE^{(0,1)}[0,a]^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{kI\,\beta\,\epsilon\,yI[0,a]\,yE^{(0,1)}[0,a]^2}{kE^2},$$

$$-\frac{kI\,\beta\,\epsilon\,\mu S\,yE[0,a]^2\,yI^{(0,1)}[0,a]}{kE^2},\ 4\,\mu S\,yI[0,a]\,yI^{(0,1)}[0,a],$$

$$\frac{\left(-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\right)\,yE^{(0,1)}[0,a]\,yI^{(0,1)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{kI\,\beta\,\epsilon\,yE[0,a]\,yE^{(0,1)}[0,a]\,yI^{(0,1)}[0,a]}{kE^2},\ yI^{(0,1)}[0,a]^2,$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yI[0,a]^2\,\left(256\,kE^4\,kI^4\,\beta^4\,\epsilon^4\,\mu S^2+256\,kE^4\,kI^4\,\beta^5\,\epsilon^4\,\mu S\,Ntot[0,a]-64\,kE^4\,kI^4\,\beta^6\,\epsilon^4\,Ntot[0,a]^2+256\,kE^4\,kI^4\,\beta^5\,\epsilon^4\,Ntot^{(0,1)}[0,a]+256\,kE^4\,kI^4\,\beta^5\,\epsilon^4\,Ntot^{(1,0)}[0,a]\right),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yI[0,a]\,yE^{(0,1)}[0,a]\,\left(-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+64\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]^2-128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(0,1)}[0,a]-128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(1,0)}[0,a]\right),\ \frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}$$

$$yE[0,a]\,yI^{(0,1)}[0,a]\,\left(-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S\,Ntot[0,a]+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(0,1)}[0,a]+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(1,0)}[0,a]\right),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]^2\,yI[0,a]\,\left(768\,kE^2\,kI^5\,\beta^5\,\delta^2\,\epsilon^3+512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4\,\mu S-64\,kE^2\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2-256\,kE^2\,kI^5\,\beta^6\,\delta\,\epsilon^4\,Ntot[0,a]-192\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,\mu S\,Ntot[0,a]-64\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,Ntot^{(0,1)}[0,a]-64\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,Ntot^{(1,0)}[0,a]\right),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]\,yE^{(0,1)}[0,a]\,\big(256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S - 128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a] - 64\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]^2 + 64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(0,1)}[0,a] + 64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(1,0)}[0,a]\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]^3\,\big(-256\,kE\,kI^6\,\beta^5\,\delta^3\,\epsilon^3 - 256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,\mu S + 64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2 + 128\,kE\,kI^6\,\beta^6\,\delta^2\,\epsilon^4\,Ntot[0,a] + 192\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a] + 64\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot^{(0,1)}[0,a] + 64\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot^{(1,0)}[0,a]\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yI^{(0,1)}[0,a]\,\big(-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S\,Ntot[0,a]^2 - 64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a] - 64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\,Ntot^{(1,0)}[0,a]\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]\times yI[0,a]\,\big(-512\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S^2 - 512\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4\,\mu S\,Ntot[0,a] + 128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2\,Ntot[0,a] + 128\,kE^3\,kI^5\,\beta^6\,\delta\,\epsilon^4\,Ntot[0,a]^2 + 192\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,\mu S\,Ntot[0,a]^2 - 512\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4\,Ntot^{(0,1)}[0,a] + 128\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a] - 512\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4\,Ntot^{(1,0)}[0,a] + 128\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]\,Ntot^{(1,0)}[0,a]\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE^{(0,1)}[0,a]\,\big(64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^2 + 64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a] + 64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(1,0)}[0,a]\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]^2\,\big(256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S^2 + 256\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,\mu S\,Ntot[0,a] - 128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2\,Ntot[0,a] - 64\,kE^2\,kI^6\,\beta^6\,\delta^2\,\epsilon^4\,Ntot[0,a]^2 - 192\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^2 + 256\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,Ntot^{(0,1)}[0,a] - 128\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a] + 256\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,Ntot^{(1,0)}[0,a] - 128\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(1,0)}[0,a]\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yI[0,a]\,\big(-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2\,Ntot[0,a]^2 - 64\,kE^4\,kI^5\,\beta^6\,\epsilon^5\,\mu S\,Ntot[0,a]^3 - 64\,kE^4\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]^2\,Ntot^{(0,1)}[0,a] + 64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(0,1)}[0,a]^2 - 64\,kE^4\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]^2\,Ntot^{(1,0)}[0,a] + 128\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] + 64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(1,0)}[0,a]^2\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]\,\big(64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2\,Ntot[0,a]^2 + 64\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^3 + 64\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]^2\,Ntot^{(0,1)}[0,a] - 64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(0,1)}[0,a]^2 + 64\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]^2\,Ntot^{(1,0)}[0,a] - 128\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(0,1)}[0,a]\,Ntot^{(1,0)}[0,a] - 64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(1,0)}[0,a]^2\big),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,\big(-256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4 + 64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S + 128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]\big)\,yE[0,a]^2\,yE^{(1,0)}[0,a],\ -\frac{kI^2\,\beta^2\,\delta\,\epsilon\,yE[0,a]^3\,yE^{(1,0)}[0,a]}{kE^4},$$

$$\frac{\big(512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4 - 128\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]\big)\,yE[0,a]\times yI[0,a]\,yE^{(1,0)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{kI\,\beta^2\,\epsilon\,yE[0,a]^2\,yI[0,a]\,yE^{(1,0)}[0,a]}{kE^3},$$

$$-\frac{4\,\beta\,yI[0,a]^2\,yE^{(1,0)}[0,a]}{kE},$$

$$\frac{\left(128\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\right)yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{2\,kI\,\beta\,\epsilon\,yI[0,a]\,yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a]}{kE^2},$$

$$\frac{\left(-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\right)yI^{(0,1)}[0,a]\,yE^{(1,0)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{kI\,\beta\,\epsilon\,yE[0,a]\,yI^{(0,1)}[0,a]\,yE^{(1,0)}[0,a]}{kE^2},$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yI[0,a]\,\Big(-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+64\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,Ntot[0,a]^2-$$
$$128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(0,1)}[0,a]-128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(1,0)}[0,a]\Big)\,yE^{(1,0)}[0,a],$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]\,\Big(256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]-$$
$$64\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,Ntot[0,a]^2+64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(0,1)}[0,a]+$$
$$64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot^{(1,0)}[0,a]\Big)\,yE^{(1,0)}[0,a],\ \frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}$$
$$\Big(64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S\,Ntot[0,a]^2+64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a]+$$
$$64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\,Ntot^{(1,0)}[0,a]\Big)\,yE^{(1,0)}[0,a],$$

$$\frac{\left(64\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,Ntot[0,a]\right)yE^{(1,0)}[0,a]^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{kI\,\beta\,\epsilon\,yI[0,a]\,yE^{(1,0)}[0,a]^2}{kE^2},$$

$$-\frac{kI\,\beta\,\epsilon\,\mu S\,yE[0,a]^2\,yI^{(1,0)}[0,a]}{kE^2},$$

$$4\,\mu S\,yI[0,a]\,yI^{(1,0)}[0,a],$$

$$\frac{\left(-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\right)yE^{(0,1)}[0,a]\,yI^{(1,0)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{kI\,\beta\,\epsilon\,yE[0,a]\,yE^{(0,1)}[0,a]\,yI^{(1,0)}[0,a]}{kE^2},$$

$$2\,yI^{(0,1)}[0,a]\,yI^{(1,0)}[0,a],$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\,yE[0,a]\,\Big(-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S\,Ntot[0,a]+$$
$$64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(0,1)}[0,a]+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot^{(1,0)}[0,a]\Big)\,yI^{(1,0)}[0,a],$$

$$\frac{1}{64\,kE^4\,kI^5\,\beta^5\,\epsilon^5}\left(-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S\,Ntot[0,a]^2-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\,Ntot^{(0,1)}[0,a]-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\,Ntot^{(1,0)}[0,a]\right)yI^{(1,0)}[0,a],$$

$$\frac{\left(-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,Ntot[0,a]\right)yE^{(1,0)}[0,a]\,yI^{(1,0)}[0,a]}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{kI\,\beta\,\epsilon\,yE[0,a]\,yE^{(1,0)}[0,a]\,yI^{(1,0)}[0,a]}{kE^2},$$

$$yI^{(1,0)}[0,a]^2\Big\}$$

Out[•]=

$$\Big\{\frac{\left(16\,kI^4\,\beta^4\,\delta^2\,\epsilon^2+32\,kI^4\,\beta^4\,\delta\,\epsilon^3\,\mu E+16\,kI^4\,\beta^4\,\epsilon^4\,\mu E^2\right)yE[0,a]^2}{16\,kI^4\,\beta^4\,\epsilon^4},\ \frac{1}{16\,kI^4\,\beta^4\,\epsilon^4}\left(-32\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^2+32\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^3-32\,kE\,kI^3\,\beta^4\,\epsilon^3\,\mu E+32\,kE\,kI^3\,\beta^4\,\epsilon^4\,\mu E\right)yE[0,a]\times yI[0,a],\ \frac{\left(16\,kE^2\,kI^2\,\beta^4\,\epsilon^2-32\,kE^2\,kI^2\,\beta^4\,\epsilon^3+16\,kE^2\,kI^2\,\beta^4\,\epsilon^4\right)yI[0,a]^2}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{\left(32\,kI^4\,\beta^4\,\delta\,\epsilon^3+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E\right)yE[0,a]\,yE^{(0,1)}[0,a]}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{\left(-32\,kE\,kI^3\,\beta^4\,\epsilon^3+32\,kE\,kI^3\,\beta^4\,\epsilon^4\right)yI[0,a]\,yE^{(0,1)}[0,a]}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$yE^{(0,1)}[0,a]^2,\ \frac{\left(32\,kI^4\,\beta^4\,\delta\,\epsilon^3+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E\right)yE[0,a]\,yE^{(1,0)}[0,a]}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{\left(-32\,kE\,kI^3\,\beta^4\,\epsilon^3+32\,kE\,kI^3\,\beta^4\,\epsilon^4\right)yI[0,a]\,yE^{(1,0)}[0,a]}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$2\,yE^{(0,1)}[0,a]\,yE^{(1,0)}[0,a],\ yE^{(1,0)}[0,a]^2\Big\}$$

In[•]:=

```
Coeffs1 = MonicMonos1 /. {yI[0, a] → 1, yE[0, a] → 1,
    (D[yI[t, a], t] /. t → 0) → 1, (D[yI[t, a], a] /. t → 0) → 1,
    (D[yI[t, a], t, a] /. t → 0) → 1, (D[yI[t, a], {t, 2}] /. t → 0) → 1,
    (D[yI[t, a], {a, 2}] /. t → 0) → 1, (D[yE[t, a], t] /. t → 0) → 1,
    (D[yE[t, a], a] /. t → 0) → 1, (D[yE[t, a], t, a] /. t → 0) → 1,
    (D[yE[t, a], {t, 2}] /. t → 0) → 1, (D[yE[t, a], {a, 2}] /. t → 0) → 1,
    Ntot[0, a] → 1, (D[Ntot[t, a], t] /. t → 0) → 1, (D[Ntot[t, a], a] /. t → 0) → 1}
Coeffs2 = MonicMonos2 /. {yI[0, a] → 1, yE[0, a] → 1, (D[yI[t, a], t] /. t → 0) → 1,
    (D[yI[t, a], a] /. t → 0) → 1, (D[yI[t, a], t, a] /. t → 0) → 1,
    (D[yI[t, a], {t, 2}] /. t → 0) → 1, (D[yI[t, a], {a, 2}] /. t → 0) → 1,
    (D[yE[t, a], t] /. t → 0) → 1, (D[yE[t, a], a] /. t → 0) → 1,
    (D[yE[t, a], t, a] /. t → 0) → 1, (D[yE[t, a], {t, 2}] /. t → 0) → 1,
    (D[yE[t, a], {a, 2}] /. t → 0) → 1, Ntot[0, a] → 1,
    (D[Ntot[t, a], t] /. t → 0) → 1, (D[Ntot[t, a], a] /. t → 0) → 1}
```

Out[•]=

$$\left\{\frac{-64\,kI^6\,\beta^6\,\delta^2\,\epsilon^4-64\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{128\,kE\,kI^5\,\beta^6\,\delta\,\epsilon^4+64\,kE\,kI^5\,\beta^6\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\right.$$

$$\frac{-768\,kE^3\,kI^4\,\beta^5\,\delta\,\epsilon^3+128\,kE^3\,kI^4\,\beta^6\,\epsilon^4-256\,kE^3\,kI^4\,\beta^5\,\epsilon^4\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ -\frac{\beta^2}{kE^2},\ \frac{4\,\beta}{kI\,\epsilon},$$

$$\frac{-256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4+128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5+64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ -\frac{kI^2\,\beta^2\,\delta\,\epsilon}{kE^4},$$

$$\frac{512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4-128\,kE^2\,kI^5\,\beta^6\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{kI\,\beta^2\,\epsilon}{kE^3},\ -\frac{4\,\beta}{kE},\ \frac{64\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{kI\,\beta\,\epsilon}{kE^2},\ -\frac{kI\,\beta\,\epsilon\,\mu S}{kE^2},\ 4\,\mu S,\ \frac{-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ -\frac{kI\,\beta\,\epsilon}{kE^2},\ 1,$$

$$\frac{512\,kE^4\,kI^4\,\beta^5\,\epsilon^4-64\,kE^4\,kI^4\,\beta^6\,\epsilon^4+256\,kE^4\,kI^4\,\beta^5\,\epsilon^4\,\mu S+256\,kE^4\,kI^4\,\beta^4\,\epsilon^4\,\mu S^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-256\,kE^3\,kI^5\,\beta^5\,\epsilon^5+64\,kE^3\,kI^5\,\beta^6\,\epsilon^5-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^3\,kI^5\,\beta^5\,\epsilon^5-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\left(768\,kE^2\,kI^5\,\beta^5\,\delta^2\,\epsilon^3-256\,kE^2\,kI^5\,\beta^6\,\delta\,\epsilon^4-128\,kE^2\,kI^5\,\beta^6\,\epsilon^5+\right.$$
$$\left.512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4\,\mu S-192\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,\mu S-64\,kE^2\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2\right),$$

$$\frac{128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5-64\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5+256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\left(-256\,kE\,kI^6\,\beta^5\,\delta^3\,\epsilon^3+128\,kE\,kI^6\,\beta^6\,\delta^2\,\epsilon^4+128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5-\right.$$
$$\left.256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,\mu S+192\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S+64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2\right),$$

$$\frac{-128\,kE^4\,kI^5\,\beta^5\,\epsilon^5-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}$$
$$\left(-1024\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4+128\,kE^3\,kI^5\,\beta^6\,\delta\,\epsilon^4+256\,kE^3\,kI^5\,\beta^6\,\epsilon^5-512\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4\,\mu S+\right.$$
$$\left.192\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,\mu S-512\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S^2+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2\right),$$

$$\frac{128\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5+64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}$$
$$\left(512\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4-64\,kE^2\,kI^6\,\beta^6\,\delta^2\,\epsilon^4-256\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5+256\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,\mu S-\right.$$
$$\left.192\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S+256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S^2-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2\right),$$

$$\frac{256\,kE^4\,kI^5\,\beta^5\,\epsilon^5-128\,kE^4\,kI^5\,\beta^6\,\epsilon^5-64\,kE^4\,kI^5\,\beta^6\,\epsilon^5\,\mu S-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-256\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5+128\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5+64\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S+64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4+128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5+64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{kI^2\,\beta^2\,\delta\,\epsilon}{kE^4},\ \frac{512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4-128\,kE^2\,kI^5\,\beta^6\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{kI\,\beta^2\,\epsilon}{kE^3},\ -\frac{4\,\beta}{kE},$$

$$\frac{128\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{2\,kI\,\beta\,\epsilon}{kE^2},\ \frac{-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$-\frac{kI\,\beta\,\epsilon}{kE^2},\ \frac{-256\,kE^3\,kI^5\,\beta^5\,\epsilon^5+64\,kE^3\,kI^5\,\beta^6\,\epsilon^5-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5-64\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5+256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5+64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{64\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{kI\,\beta\,\epsilon}{kE^2},\ -\frac{kI\,\beta\,\epsilon\,\mu S}{kE^2},\ 4\,\mu S,\ \frac{-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ -\frac{kI\,\beta\,\epsilon}{kE^2},$$

$$2,\ \frac{128\,kE^3\,kI^5\,\beta^5\,\epsilon^5-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-128\,kE^4\,kI^5\,\beta^5\,\epsilon^5-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ -\frac{kI\,\beta\,\epsilon}{kE^2},\ 1\Big\}$$

Out[•]=

$$\Big\{\frac{16\,kI^4\,\beta^4\,\delta^2\,\epsilon^2+32\,kI^4\,\beta^4\,\delta\,\epsilon^3\,\mu E+16\,kI^4\,\beta^4\,\epsilon^4\,\mu E^2}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-32\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^2+32\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^3-32\,kE\,kI^3\,\beta^4\,\epsilon^3\,\mu E+32\,kE\,kI^3\,\beta^4\,\epsilon^4\,\mu E}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{16\,kE^2\,kI^2\,\beta^4\,\epsilon^2-32\,kE^2\,kI^2\,\beta^4\,\epsilon^3+16\,kE^2\,kI^2\,\beta^4\,\epsilon^4}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{32\,kI^4\,\beta^4\,\delta\,\epsilon^3+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E}{16\,kI^4\,\beta^4\,\epsilon^4},\ \frac{-32\,kE\,kI^3\,\beta^4\,\epsilon^3+32\,kE\,kI^3\,\beta^4\,\epsilon^4}{16\,kI^4\,\beta^4\,\epsilon^4},\ 1,$$

$$\frac{32\,kI^4\,\beta^4\,\delta\,\epsilon^3+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E}{16\,kI^4\,\beta^4\,\epsilon^4},\ \frac{-32\,kE\,kI^3\,\beta^4\,\epsilon^3+32\,kE\,kI^3\,\beta^4\,\epsilon^4}{16\,kI^4\,\beta^4\,\epsilon^4},\ 2,\ 1\Big\}$$

In[•]:=
```
Coeffs = Union[Coeffs1, Coeffs2]
```

Out[•]=

$$\Big\{1,\ 2,\ -\frac{4\,\beta}{kE},\ -\frac{\beta^2}{kE^2},\ \frac{4\,\beta}{kI\,\epsilon},\ -\frac{kI\,\beta\,\epsilon}{kE^2},\ \frac{kI\,\beta\,\epsilon}{kE^2},\ \frac{2\,kI\,\beta\,\epsilon}{kE^2},\ \frac{kI\,\beta^2\,\epsilon}{kE^3},\ -\frac{kI^2\,\beta^2\,\delta\,\epsilon}{kE^4},$$

$$\frac{16\,kE^2\,kI^2\,\beta^4\,\epsilon^2-32\,kE^2\,kI^2\,\beta^4\,\epsilon^3+16\,kE^2\,kI^2\,\beta^4\,\epsilon^4}{16\,kI^4\,\beta^4\,\epsilon^4},\ \frac{-32\,kE\,kI^3\,\beta^4\,\epsilon^3+32\,kE\,kI^3\,\beta^4\,\epsilon^4}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-128\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4+64\,kE^3\,kI^5\,\beta^5\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4-128\,kE^2\,kI^5\,\beta^6\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{64\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4-64\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-32\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^2+32\,kE\,kI^3\,\beta^4\,\delta\,\epsilon^3-32\,kE\,kI^3\,\beta^4\,\epsilon^3\,\mu E+32\,kE\,kI^3\,\beta^4\,\epsilon^4\,\mu E}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{32\,kI^4\,\beta^4\,\delta\,\epsilon^3+32\,kI^4\,\beta^4\,\epsilon^4\,\mu E}{16\,kI^4\,\beta^4\,\epsilon^4},\ \frac{16\,kI^4\,\beta^4\,\delta^2\,\epsilon^2+32\,kI^4\,\beta^4\,\delta\,\epsilon^3\,\mu E+16\,kI^4\,\beta^4\,\epsilon^4\,\mu E^2}{16\,kI^4\,\beta^4\,\epsilon^4},$$

$$4\,\mu S,\ -\frac{kI\,\beta\,\epsilon\,\mu S}{kE^2},\ \frac{-768\,kE^3\,kI^4\,\beta^5\,\delta\,\epsilon^3+128\,kE^3\,kI^4\,\beta^6\,\epsilon^4-256\,kE^3\,kI^4\,\beta^5\,\epsilon^4\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-256\,kE^3\,kI^5\,\beta^5\,\epsilon^5+64\,kE^3\,kI^5\,\beta^6\,\epsilon^5-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^3\,kI^5\,\beta^5\,\epsilon^5-256\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-128\,kE^4\,kI^5\,\beta^5\,\epsilon^5-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{128\,kE\,kI^5\,\beta^6\,\delta\,\epsilon^4+64\,kE\,kI^5\,\beta^6\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{-256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4+128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5+64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5-64\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5+256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S-128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{128\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5+64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},\ \frac{-64\,kI^6\,\beta^6\,\delta^2\,\epsilon^4-64\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{512\,kE^4\,kI^4\,\beta^5\,\epsilon^4-64\,kE^4\,kI^4\,\beta^6\,\epsilon^4+256\,kE^4\,kI^4\,\beta^5\,\epsilon^4\,\mu S+256\,kE^4\,kI^4\,\beta^4\,\epsilon^4\,\mu S^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\left(768\,kE^2\,kI^5\,\beta^5\,\delta^2\,\epsilon^3-256\,kE^2\,kI^5\,\beta^6\,\delta\,\epsilon^4-128\,kE^2\,kI^5\,\beta^6\,\epsilon^5+\right.$$
$$\left.512\,kE^2\,kI^5\,\beta^5\,\delta\,\epsilon^4\,\mu S-192\,kE^2\,kI^5\,\beta^6\,\epsilon^5\,\mu S-64\,kE^2\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2\right),$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\left(-1024\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4+128\,kE^3\,kI^5\,\beta^6\,\delta\,\epsilon^4+256\,kE^3\,kI^5\,\beta^6\,\epsilon^5-\right.$$
$$\left.512\,kE^3\,kI^5\,\beta^5\,\delta\,\epsilon^4\,\mu S+192\,kE^3\,kI^5\,\beta^6\,\epsilon^5\,\mu S-512\,kE^3\,kI^5\,\beta^4\,\delta\,\epsilon^4\,\mu S^2+128\,kE^3\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2\right),$$

$$\frac{256\,kE^4\,kI^5\,\beta^5\,\epsilon^5-128\,kE^4\,kI^5\,\beta^6\,\epsilon^5-64\,kE^4\,kI^5\,\beta^6\,\epsilon^5\,\mu S-64\,kE^4\,kI^5\,\beta^5\,\epsilon^5\,\mu S^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4},$$

$$\frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\left(-256\,kE\,kI^6\,\beta^5\,\delta^3\,\epsilon^3+128\,kE\,kI^6\,\beta^6\,\delta^2\,\epsilon^4+128\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5-\right.$$
$$\left.256\,kE\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,\mu S+192\,kE\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S+64\,kE\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2\right),\ \frac{1}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}$$

$$\left(512\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4 - 64\,kE^2\,kI^6\,\beta^6\,\delta^2\,\epsilon^4 - 256\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5 + 256\,kE^2\,kI^6\,\beta^5\,\delta^2\,\epsilon^4\,\mu S - 192\,kE^2\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S + 256\,kE^2\,kI^6\,\beta^4\,\delta^2\,\epsilon^4\,\mu S^2 - 128\,kE^2\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2\right),$$

$$\left.\frac{-256\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5 + 128\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5 + 64\,kE^3\,kI^6\,\beta^6\,\delta\,\epsilon^5\,\mu S + 64\,kE^3\,kI^6\,\beta^5\,\delta\,\epsilon^5\,\mu S^2}{64\,kE^4\,kI^4\,\beta^4\,\epsilon^4}\right\}$$

In[ ]:=
```
xCoeffs =
Coeffs /. {β → a1, δ → a2, ϵ → a3, μS → a4, μE → a5, μI → a6, c → a7, kE → a8, kI → a9}
```

Out[ ]=

$$\left\{1,\ 2,\ -\frac{4\,a1}{a8},\ -\frac{a1^2}{a8^2},\ \frac{4\,a1}{a3\,a9},\ -\frac{a1\,a3\,a9}{a8^2},\ \frac{a1\,a3\,a9}{a8^2},\ \frac{2\,a1\,a3\,a9}{a8^2},\ \frac{a1^2\,a3\,a9}{a8^3},\right.$$

$$-\frac{a1^2\,a2\,a3\,a9^2}{a8^4},\ \frac{16\,a1^4\,a3^2\,a8^2\,a9^2 - 32\,a1^4\,a3^3\,a8^2\,a9^2 + 16\,a1^4\,a3^4\,a8^2\,a9^2}{16\,a1^4\,a3^4\,a9^4},$$

$$\frac{-32\,a1^4\,a3^3\,a8\,a9^3 + 32\,a1^4\,a3^4\,a8\,a9^3}{16\,a1^4\,a3^4\,a9^4},\ \frac{-128\,a1^4\,a2\,a3^4\,a8^3\,a9^5 + 64\,a1^5\,a3^5\,a8^3\,a9^5}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{512\,a1^5\,a2\,a3^4\,a8^2\,a9^5 - 128\,a1^6\,a3^5\,a8^2\,a9^5}{64\,a1^4\,a3^4\,a8^4\,a9^4},\ \frac{128\,a1^4\,a2^2\,a3^4\,a8^2\,a9^6 - 128\,a1^5\,a2\,a3^5\,a8^2\,a9^6}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{64\,a1^4\,a2^2\,a3^4\,a8^2\,a9^6 - 64\,a1^5\,a2\,a3^5\,a8^2\,a9^6}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{-32\,a1^4\,a2\,a3^2\,a8\,a9^3 + 32\,a1^4\,a2\,a3^3\,a8\,a9^3 - 32\,a1^4\,a3^3\,a5\,a8\,a9^3 + 32\,a1^4\,a3^4\,a5\,a8\,a9^3}{16\,a1^4\,a3^4\,a9^4},$$

$$\frac{32\,a1^4\,a2\,a3^3\,a9^4 + 32\,a1^4\,a3^4\,a5\,a9^4}{16\,a1^4\,a3^4\,a9^4},$$

$$\frac{16\,a1^4\,a2^2\,a3^2\,a9^4 + 32\,a1^4\,a2\,a3^3\,a5\,a9^4 + 16\,a1^4\,a3^4\,a5^2\,a9^4}{16\,a1^4\,a3^4\,a9^4},\ 4\,a4,\ -\frac{a1\,a3\,a4\,a9}{a8^2},$$

$$\frac{-768\,a1^5\,a2\,a3^3\,a8^3\,a9^4 + 128\,a1^6\,a3^4\,a8^3\,a9^4 - 256\,a1^5\,a3^4\,a4\,a8^3\,a9^4}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{-256\,a1^5\,a3^5\,a8^3\,a9^5 + 64\,a1^6\,a3^5\,a8^3\,a9^5 - 256\,a1^4\,a2\,a3^4\,a4\,a8^3\,a9^5}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{128\,a1^5\,a3^5\,a8^3\,a9^5 - 256\,a1^4\,a2\,a3^4\,a4\,a8^3\,a9^5 + 128\,a1^5\,a3^5\,a4\,a8^3\,a9^5}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{-128\,a1^5\,a3^5\,a8^4\,a9^5 - 64\,a1^5\,a3^5\,a4\,a8^4\,a9^5}{64\,a1^4\,a3^4\,a8^4\,a9^4},\ \frac{128\,a1^6\,a2\,a3^4\,a8\,a9^5 + 64\,a1^6\,a3^5\,a4\,a8\,a9^5}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{-256\,a1^5\,a2^2\,a3^4\,a8\,a9^6 + 128\,a1^6\,a2\,a3^5\,a8\,a9^6 + 64\,a1^5\,a2\,a3^5\,a4\,a8\,a9^6}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{1}{64\,a1^4\,a3^4\,a8^4\,a9^4}\left(128\,a1^5\,a2\,a3^5\,a8^2\,a9^6 - 64\,a1^6\,a2\,a3^5\,a8^2\,a9^6 + 256\,a1^4\,a2^2\,a3^4\,a4\,a8^2\,a9^6 - 128\,a1^5\,a2\,a3^5\,a4\,a8^2\,a9^6\right),$$

$$\frac{128\,a1^5\,a2\,a3^5\,a8^3\,a9^6 + 64\,a1^5\,a2\,a3^5\,a4\,a8^3\,a9^6}{64\,a1^4\,a3^4\,a8^4\,a9^4},\ \frac{-64\,a1^6\,a2^2\,a3^4\,a9^6 - 64\,a1^6\,a2\,a3^5\,a4\,a9^6}{64\,a1^4\,a3^4\,a8^4\,a9^4},$$

$$\frac{512\, a1^5\, a3^4\, a8^4\, a9^4 - 64\, a1^6\, a3^4\, a8^4\, a9^4 + 256\, a1^5\, a3^4\, a4\, a8^4\, a9^4 + 256\, a1^4\, a3^4\, a4^2\, a8^4\, a9^4}{64\, a1^4\, a3^4\, a8^4\, a9^4},$$

$$\frac{1}{64\, a1^4\, a3^4\, a8^4\, a9^4}\left(768\, a1^5\, a2^2\, a3^3\, a8^2\, a9^5 - 256\, a1^6\, a2\, a3^4\, a8^2\, a9^5 - 128\, a1^6\, a3^5\, a8^2\, a9^5 + 512\, a1^5\, a2\, a3^4\, a4\, a8^2\, a9^5 - 192\, a1^6\, a3^5\, a4\, a8^2\, a9^5 - 64\, a1^5\, a3^5\, a4^2\, a8^2\, a9^5\right),$$

$$\frac{1}{64\, a1^4\, a3^4\, a8^4\, a9^4}\left(-1024\, a1^5\, a2\, a3^4\, a8^3\, a9^5 + 128\, a1^6\, a2\, a3^4\, a8^3\, a9^5 + 256\, a1^6\, a3^5\, a8^3\, a9^5 - 512\, a1^5\, a2\, a3^4\, a4\, a8^3\, a9^5 + 192\, a1^6\, a3^5\, a4\, a8^3\, a9^5 - 512\, a1^4\, a2\, a3^4\, a4^2\, a8^3\, a9^5 + 128\, a1^5\, a3^5\, a4^2\, a8^3\, a9^5\right),$$

$$\frac{256\, a1^5\, a3^5\, a8^4\, a9^5 - 128\, a1^6\, a3^5\, a8^4\, a9^5 - 64\, a1^6\, a3^5\, a4\, a8^4\, a9^5 - 64\, a1^5\, a3^5\, a4^2\, a8^4\, a9^5}{64\, a1^4\, a3^4\, a8^4\, a9^4},$$

$$\frac{1}{64\, a1^4\, a3^4\, a8^4\, a9^4}\left(-256\, a1^5\, a2^3\, a3^3\, a8\, a9^6 + 128\, a1^6\, a2^2\, a3^4\, a8\, a9^6 + 128\, a1^6\, a2\, a3^5\, a8\, a9^6 - 256\, a1^5\, a2^2\, a3^4\, a4\, a8\, a9^6 + 192\, a1^6\, a2\, a3^5\, a4\, a8\, a9^6 + 64\, a1^5\, a2\, a3^5\, a4^2\, a8\, a9^6\right),$$

$$\frac{1}{64\, a1^4\, a3^4\, a8^4\, a9^4}\left(512\, a1^5\, a2^2\, a3^4\, a8^2\, a9^6 - 64\, a1^6\, a2^2\, a3^4\, a8^2\, a9^6 - 256\, a1^6\, a2\, a3^5\, a8^2\, a9^6 + 256\, a1^5\, a2^2\, a3^4\, a4\, a8^2\, a9^6 - 192\, a1^6\, a2\, a3^5\, a4\, a8^2\, a9^6 + 256\, a1^4\, a2^2\, a3^4\, a4^2\, a8^2\, a9^6 - 128\, a1^5\, a2\, a3^5\, a4^2\, a8^2\, a9^6\right),$$

$$\frac{1}{64\, a1^4\, a3^4\, a8^4\, a9^4}\left(-256\, a1^5\, a2\, a3^5\, a8^3\, a9^6 + 128\, a1^6\, a2\, a3^5\, a8^3\, a9^6 + 64\, a1^6\, a2\, a3^5\, a4\, a8^3\, a9^6 + 64\, a1^5\, a2\, a3^5\, a4^2\, a8^3\, a9^6\right)\Big\}$$

In[•]:=
```
Solve[Coeffs == xCoeffs, {β, δ, ϵ, μS, μE, μI, c, kE, kI}]
```

Solve: Equations may not give solutions for all "solve" variables.

Out[•]= $\{\{\beta \to a1,\ \delta \to a2,\ \epsilon \to a3,\ \mu S \to a4,\ \mu E \to a5,\ kE \to a8,\ kI \to a9\}\}$

In[ ]:=

```
(* extra junk *)
```

In[ ]:=

```
GroebnerBasis[Coeffs - xCoeffs, {β, δ, ϵ, μS, μE, μI, c, kE}]
```

Out[ ]=

$$\left\{-a3\,a7+c-\frac{a7\,a8}{kE}+\frac{a3\,a7\,a8}{kE},\ -\frac{a8}{c}+\frac{a8}{a3\,c}-\frac{kE}{a3\,a7}+\frac{kE}{c},\ \frac{1}{a7\,a8}-\frac{a3}{a8\,c}-\frac{1}{c\,kE}+\frac{a3}{c\,kE},\right.$$
$$-\frac{1}{a3\,a7\,a8}+\frac{1}{a8\,c}-\frac{1}{c\,kE}+\frac{1}{a3\,c\,kE},\ -a6+\mu I,\ -a2-a5+\frac{a2\,kE}{a8}+\mu E,$$
$$\left.-a4+\mu S,\ -\frac{a3\,a7}{c}+\epsilon,\ -1+\frac{a8}{kE}-\frac{a8}{a3\,kE}+\frac{1}{\epsilon},\ -\frac{a2\,kE}{a8}+\delta,\ -a1+\beta,\ -\frac{1}{a1}+\frac{1}{\beta}\right\}$$