In[5]:= `Sol = DSolve[y''[x] + y[x] == 0, y[x], x]`
`Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 2}]`
`Sol2 = y[x] /. Sol[[1]] /. {C[1] → 1 / 2, C[2] → 5}`
`Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4}`
`Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},`
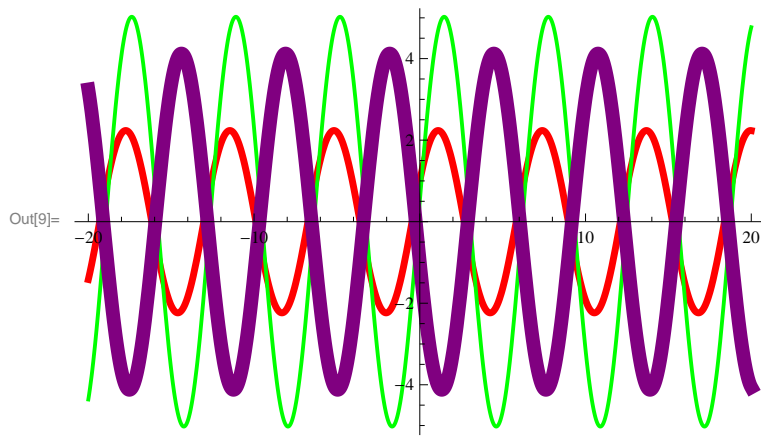`  PlotStyle → {{Red, Thickness[0.01]}, {Green, Thick}, {Purple, Thickness[0.02]}}]`

Out[5]= $\{\{y[x] \to C[1] \, Cos[x] + C[2] \, Sin[x]\}\}$

Out[6]= $Cos[x] + 2 \, Sin[x]$

Out[7]= $\dfrac{Cos[x]}{2} + 5 \, Sin[x]$

Out[8]= $-Cos[x] - 4 \, Sin[x]$

Out[9]=

In[10]:=
```
Sol = DSolve[y''[x] + y'[x] - 6 y[x] == 0, y[x], x]
Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 0, C[2] → 2.5}]
Sol2 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 5}
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1 / 2, C[2] → 5}
Plot[{Sol1, Sol2, Sol3}, {x, -2, 2},
 PlotStyle → {{Red, Thickness[0.01]}, {Green, Thick}, {Purple, Thickness[0.02]}}]
```
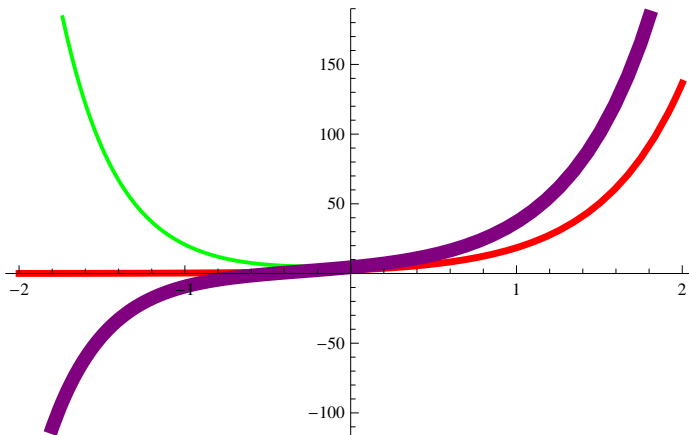
Out[10]= $\left\{\left\{y[x] \to e^{-3 x} C[1] + e^{2 x} C[2]\right\}\right\}$

Out[11]= $2.5\, e^{2 x}$

Out[12]= $e^{-3 x} + 5\, e^{2 x}$

Out[13]= $-\dfrac{1}{2}\, e^{-3 x} + 5\, e^{2 x}$

Out[14]=

In[75]:=
```
Sol = DSolve[4 * y''[x] + 12 * y'[x] + 9 * y[x] == 0, y[x], x]
Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → 4}]
Sol2 = y[x] /. Sol[[1]] /. {C[1] → 3, C[2] → 6}
Sol3 = y[x] /. Sol[[1]] /. {C[1] → 10, C[2] → 7}
Sol4 = y[x] /. Sol[[1]] /. {C[1] → -1.5, C[2] → -5}
Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -2, 2},
 PlotStyle → {{Pink, Thickness[0.01]}, {Green, Thick},
    {Purple, Thickness[0.01]}, {Yellow, Thickness[0.02]}}]
```
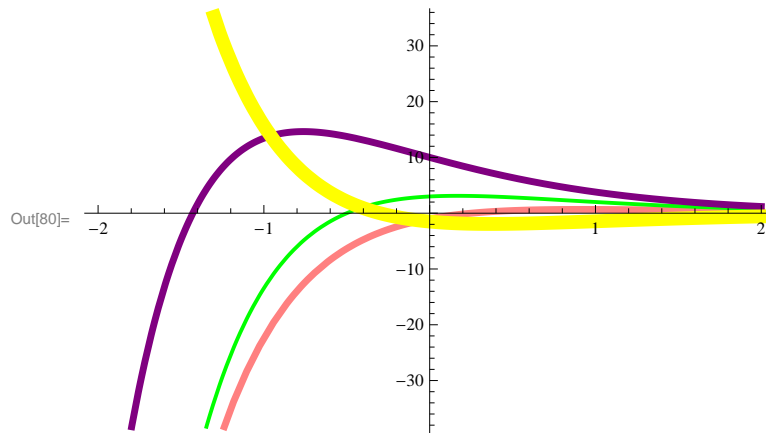
Out[75]= $\left\{\left\{y[x] \to e^{-3x/2} C[1] + e^{-3x/2} x C[2]\right\}\right\}$

Out[76]= $-e^{-3x/2} + 4 e^{-3x/2} x$

Out[77]= $3 e^{-3x/2} + 6 e^{-3x/2} x$

Out[78]= $10 e^{-3x/2} + 7 e^{-3x/2} x$

Out[79]= $-1.5 e^{-3x/2} - 5 e^{-3x/2} x$

Out[80]=

```
In[58]:= Sol = DSolve[y''[x] - 6 y'[x] + 13 y[x] == 0, y[x], x]
         Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → 4}]
         Sol2 = y[x] /. Sol[[1]] /. {C[1] → 3, C[2] → 6}
         Sol3 = y[x] /. Sol[[1]] /. {C[1] → -10, C[2] → 7}
         Plot[{Sol1, Sol2, Sol3}, {x, -5, 5}, PlotStyle →
           {{Pink, Thickness[0.01]}, {Green, Thick}, {Orange, Thickness[0.01]}}, PlotRange → All]
```
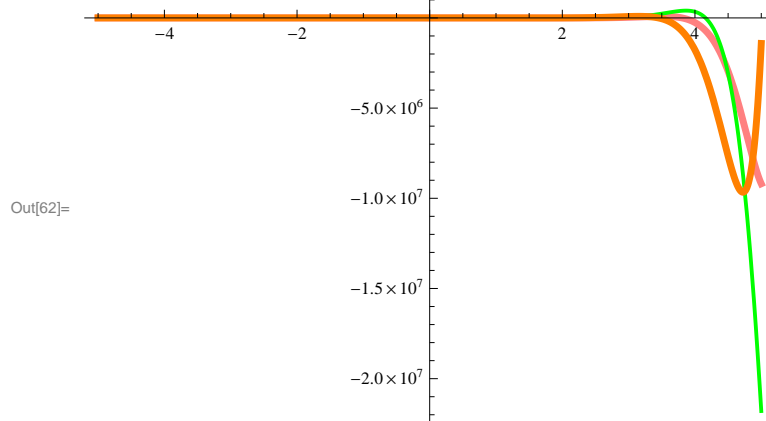
Out[58]= $\left\{\left\{y[x] \rightarrow e^{3x} C[2] \cos[2x] + e^{3x} C[1] \sin[2x]\right\}\right\}$

Out[59]= $4 e^{3x} \cos[2x] - e^{3x} \sin[2x]$

Out[60]= $6 e^{3x} \cos[2x] + 3 e^{3x} \sin[2x]$

Out[61]= $7 e^{3x} \cos[2x] - 10 e^{3x} \sin[2x]$

Out[62]=

In[99]:= `Sol = DSolve[y''[x] - 2 * y'[x] + y[x] == 0, y[x], x]`
`Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 0.5, C[2] → 3}]`
`Sol2 = y[x] /. Sol[[1]] /. {C[1] → -3, C[2] → -2}`
`Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → 7}`
`Sol4 = y[x] /. Sol[[1]] /. {C[1] → -6, C[2] → 1}`
`Sol5 = y[x] /. Sol[[1]] /. {C[1] → 1/5, C[2] → 2/3}`
`Plot[{Sol1, Sol2, Sol3, Sol4, Sol5}, {x, -5, 5},`
 `PlotStyle → {{Pink, Thickness[0.01]}, {Green, Thick},`
   `{Purple, Thickness[0.01]}, {Yellow, Thickness[0.02]}}]`

Out[99]= $\{\{y[x] \to e^x C[1] + e^x x C[2]\}\}$

Out[100]= $0.5 e^x + 3 e^x x$

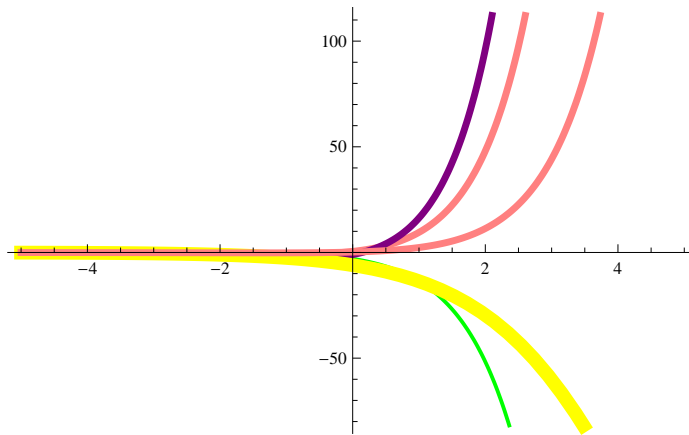Out[101]= $-3 e^x - 2 e^x x$

Out[102]= $-e^x + 7 e^x x$

Out[103]= $-6 e^x + e^x x$

Out[104]= $\dfrac{e^x}{5} + \dfrac{2 e^x x}{3}$

Out[105]=

In[151]:= `Sol = DSolve[y'''[x] - 5 * y''[x] + 8 y'[x] - 4 y[x] == 0, y[x], x]`
`Sol1 = Evaluate[y[x] /. Sol[[1]]] /. {C[1] → 0.5, C[2] → 3, C[3] → 2 / 3}]`
`Sol2 = y[x] /. Sol[[1]] /. {C[1] → -1 / 2, C[2] → 0, C[3] → 1}`
`Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 2}`
`Plot[{Sol1, Sol2, Sol3}, {x, -5 , 3}, PlotRange → {-30, 30},`
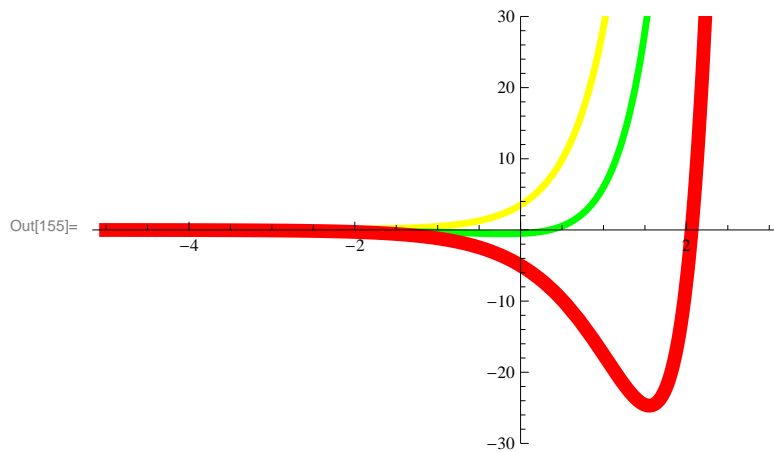`  PlotStyle → {{Yellow, Thickness[0.01]}, {Green, Thickness[0.01]}, {Red, Thickness[0.02]}}]`

Out[151]= $\left\{\left\{y[x] \to e^x C[1] + e^{2x} C[2] + e^{2x} x C[3]\right\}\right\}$

Out[152]= $0.5 \, e^x + 3 \, e^{2x} + \frac{2}{3} \, e^{2x} x$

Out[153]= $-\frac{e^x}{2} + e^{2x} x$

Out[154]= $-e^x - 4 \, e^{2x} + 2 \, e^{2x} x$

Out[155]=

In[192]:= `Sol = DSolve[y'''[x] + 3 * y''[x] - 25 y'[x] + 21 y[x] == 0, y[x], x]`
`Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}]`
`Sol2 = y[x] /. Sol[[1]] /. {C[1] → -1 / 2, C[2] → 0, C[3] → 1}`
`Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 2}`
`Sol4 = y[x] /. Sol[[1]] /. {C[1] → -0.5, C[2] → -2, C[3] → 1}`
`Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -0.5 , 0.5},`
` PlotRange → {-30, 30}, PlotStyle → {{Purple, Thickness[0.01]},`
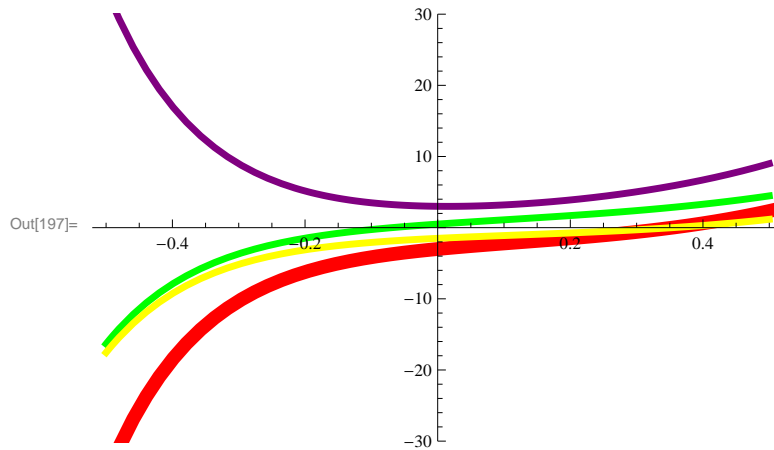`  {Green, Thickness[0.01]}, {Red, Thickness[0.02]}, {Yellow, Thickness[0.01]}}]`

Out[192]= $\left\{\left\{y[x] \to e^{-7x} C[1] + e^{x} C[2] + e^{3x} C[3]\right\}\right\}$

Out[193]= $e^{-7x} + 2 e^{3x}$

Out[194]= $-\dfrac{1}{2} e^{-7x} + e^{3x}$

Out[195]= $-e^{-7x} - 4 e^{x} + 2 e^{3x}$

Out[196]= $-0.5 e^{-7x} - 2 e^{x} + e^{3x}$

Out[197]=

In[234]:= `Sol = DSolve[y'''[x] - 4 * y''[x] - 25 y'[x] + 28 y[x] == 0, y[x], x]`
`Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}]`
`Sol2 = y[x] /. Sol[[1]] /. {C[1] → -2, C[2] → 10, C[3] → 3}`
`Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 20}`
`Sol4 = y[x] /. Sol[[1]] /. {C[1] → -0.5, C[2] → -2, C[3] → 1}`
`Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -0.5, 0.5}, PlotRange → {-30, 30},`
` PlotStyle → {Red, Green, Purple, Orange}, PlotLabel → {Sol1, Sol2, Sol3, Sol4}]`

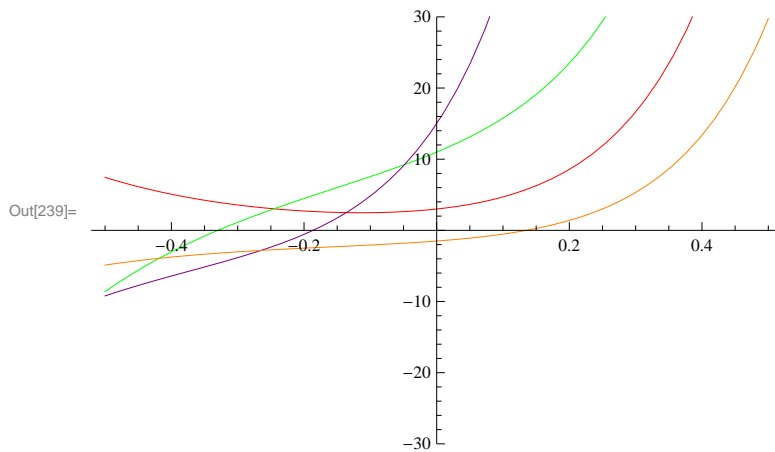Out[234]= $\left\{\left\{y[x] \to e^{-4x} C[1] + e^{x} C[2] + e^{7x} C[3]\right\}\right\}$

Out[235]= $e^{-4x} + 2 e^{7x}$

Out[236]= $-2 e^{-4x} + 10 e^{x} + 3 e^{7x}$

Out[237]= $-e^{-4x} - 4 e^{x} + 20 e^{7x}$

Out[238]= $-0.5 e^{-4x} - 2 e^{x} + e^{7x}$

$+ 2 e^{7x}, -2 e^{-4x} + 10 e^{x} + 3 e^{7x}, -e^{-4x} - 4 e^{x} + 20 e^{7x}, -0.5 e^{-4x} - 2 e^{x}$

Out[239]=

```
In[264]:= Sol = DSolve[y'''[x] - 13 * y''[x] + 19 y'[x] + 33 y[x] == Cos[2 * x], y[x], x]
       Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}]
       Sol2 = y[x] /. Sol[[1]] /. {C[1] → 10, C[2] → 3, C[3] → 6}
       Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -7, C[3] → 0.7}
       Sol4 = y[x] /. Sol[[1]] /. {C[1] → -10.5, C[2] → 2, C[3] → 1}
       Plot[{Sol1, Sol2, Sol3, Sol4}, {x, 4 , 6},
        PlotStyle → {{Purple, Thickness[0.01]}, {Green, Thickness[0.01]},
           {Red, Thickness[0.02]}, {Yellow, Thickness[0.01]}}]
```
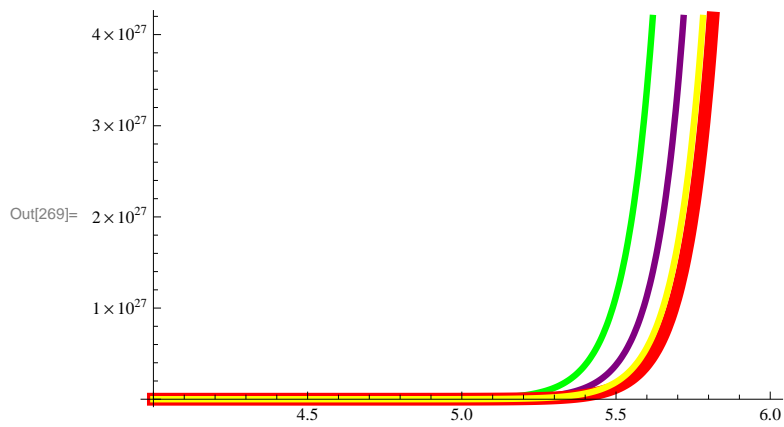
Out[264]= $\left\{\left\{y[x] \to e^{-x} C[1] + e^{3x} C[2] + e^{11x} C[3] + \dfrac{17 \cos[2x] + 6 \sin[2x]}{1625}\right\}\right\}$

Out[265]= $e^{-x} + 2 e^{11x} + \dfrac{17 \cos[2x] + 6 \sin[2x]}{1625}$

Out[266]= $10 e^{-x} + 3 e^{3x} + 6 e^{11x} + \dfrac{17 \cos[2x] + 6 \sin[2x]}{1625}$

Out[267]= $-e^{-x} - 7 e^{3x} + 0.7 e^{11x} + \dfrac{17 \cos[2x] + 6 \sin[2x]}{1625}$

Out[268]= $-10.5 e^{-x} + 2 e^{3x} + e^{11x} + \dfrac{17 \cos[2x] + 6 \sin[2x]}{1625}$

Out[269]=

```
In[284]:= Sol = DSolve[y'''[x] - 2 y[x] == 0, y[x], x]
     Sol1 = Evaluate[y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}]
     Sol2 = y[x] /. Sol[[1]] /. {C[1] → 10, C[2] → 3, C[3] → 6}
     Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -7, C[3] → 0.7}
     Sol4 = y[x] /. Sol[[1]] /. {C[1] → -10.5, C[2] → 2, C[3] → 1}
     Sol5 = y[x] /. Sol[[1]] /. {C[1] → 15, C[2] → -6, C[3] → 10}
     Plot[{Sol1, Sol2, Sol3, Sol4, Sol5}, {x, -7 , 4},
      PlotStyle → {{Purple, Thickness[0.01]}, {Green, Thickness[0.01]},
         {Red, Thickness[0.02]}, {Blue, Thickness[0.02]}, {Yellow, Thickness[0.01]}}]
```

$$\text{Out[284]= } \left\{\left\{ y[x] \to e^{2^{1/3} x} \, C[3] + e^{-\frac{x}{2^{2/3}}} \, C[1] \, \cos\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right] + e^{-\frac{x}{2^{2/3}}} \, C[2] \, \sin\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right] \right\}\right\}$$

$$\text{Out[285]= } 2 \, e^{2^{1/3} x} + e^{-\frac{x}{2^{2/3}}} \cos\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right]$$

$$\text{Out[286]= } 6 \, e^{2^{1/3} x} + 10 \, e^{-\frac{x}{2^{2/3}}} \cos\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right] + 3 \, e^{-\frac{x}{2^{2/3}}} \sin\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right]$$

$$\text{Out[287]= } 0.7 \, e^{2^{1/3} x} - e^{-\frac{x}{2^{2/3}}} \cos\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right] - 7 \, e^{-\frac{x}{2^{2/3}}} \sin\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right]$$

$$\text{Out[288]= } e^{2^{1/3} x} - 10.5 \, e^{-\frac{x}{2^{2/3}}} \cos\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right] + 2 \, e^{-\frac{x}{2^{2/3}}} \sin\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right]$$

$$\text{Out[289]= } 10 \, e^{2^{1/3} x} + 15 \, e^{-\frac{x}{2^{2/3}}} \cos\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right] - 6 \, e^{-\frac{x}{2^{2/3}}} \sin\left[\frac{\sqrt{3}\ x}{2^{2/3}}\right]$$

Out[290]=