

Problem 1

In[3]= $y[x_] = \text{Exp}[2 x] - 1;$
 $y'[x] - 2 y[x] == 2 // \text{Simplify}$

Out[4]= True

In[9]= $f[t] = a \text{Cos}[2 t] + b \text{Sin}[2 t];$
 $\partial_{t,t} f[t] + 4 f[t] == 0 // \text{Simplify}$

Out[10]= True

In[13]= $y[x] = 2 x^3 + 3 x^2 + 4 x + 5;$
 $\partial_{x,x,x} y[x] == 12 // \text{Simplify}$

Out[14]= True

Problem 2

Clear[y];

In[22]= **DSolve**[$y'[x] == 3 x^2 / y[x], y[x], x$]

Out[22]= $\left\{ \left\{ y[x] \rightarrow -\sqrt{2} \sqrt{x^3 + C[1]} \right\}, \left\{ y[x] \rightarrow \sqrt{2} \sqrt{x^3 + C[1]} \right\} \right\}$

In[20]= **DSolve**[$\{y'[x] == 3 x^2 / y[x], y[0] == 1\}, y[x], x$]

Out[20]= $\left\{ \left\{ y[x] \rightarrow \sqrt{1 + 2 x^3} \right\} \right\}$

In[23]= **DSolve**[$y'[x] == 4 x (y[x])^2, y[x], x$]

Out[23]= $\left\{ \left\{ y[x] \rightarrow \frac{1}{-2 x^2 - C[1]} \right\} \right\}$

In[21]= **DSolve**[$\{y'[x] == 4 x (y[x])^2, y[0] == 1\}, y[x], x$]

Out[21]= $\left\{ \left\{ y[x] \rightarrow \frac{1}{1 - 2 x^2} \right\} \right\}$

Problem 3

In[24]= **DSolve**[$y'[x] + 2 y[x] == 4, y[x], x$]

Out[24]= $\left\{ \left\{ y[x] \rightarrow 2 + e^{-2 x} C[1] \right\} \right\}$

In[25]= **DSolve**[$y'[x] - 4 x y[x] == x, y[x], x$]

Out[25]= $\left\{ \left\{ y[x] \rightarrow -\frac{1}{4} + e^{2 x^2} C[1] \right\} \right\}$

In[26]= **DSolve**[$y'[x] + 2 y[x] / x == 2 \text{Cos}[x], y[x], x$]

Out[26]= $\left\{ \left\{ y[x] \rightarrow \frac{C[1]}{x^2} + \frac{2 (2 x \text{Cos}[x] + (-2 + x^2) \text{Sin}[x])}{x^2} \right\} \right\}$

In[27]:= **DSolve**[$y'[x] + a y[x] / x == x^n$, $y[x]$, x]

Out[27]= $\left\{ \left\{ y[x] \rightarrow \frac{x^{1+n}}{1+a+n} + x^{-a} C[1] \right\} \right\}$