1. For each of the following check if the function given is or is not a solution to the differential equation given.
   (a) Is $y = 2x^2 + 1$ a solution to $y - \frac{1}{2}xy' = 1$ ?

   (b) Is $f(t) = \sin(3t)$ a solution to $9f(t) + f''(t) = 0$ ?

   (c) Is $y = \frac{1}{t}$ a solution to $y' = y^2$ ?

   (d) Is $y = \sqrt{t}$ a solution to $yy' = \frac{1}{2}$ ?

2. The following differential equations have a solution that you can get by using prior knowledge and a little trial-and-error. Find a solution to each. You don’t need to show how you found your solution, just show that it works.
   (a) $y' = y$ (Hint: What function do you know which equals its own derivative?)

   (b) $f''(t) = -f(t)$

   (c) $f'(t) = 3$ (Hint: The answer is obvious. What may not be obvious is that this is in fact a differential equation!)
3. Give the order of each of the following differential equations.
   (a) \( t^3 y' + (y'')^2 = 3y + 1 \)
   
   (b) \( y'' = 3t + 1 \)

   (c) \( f^{(5)}(t) + f''(t) = t^2 + t + f(t) - 1 \)

4. Determine whether each of the following differential equations is linear. If not explain what is not permitted.
   (a) \( ty' + t^2y = \sin t \)

   (b) \( yy' + t^2y = e^t \)

   (c) \( te^y + y' = 2t + 1 \)

   (d) \( \sin(t)y'' - \frac{1}{t}y' = y + 1 \)