

Please show and explain your work where necessary. Good luck!!

1. (5 points) For each of the following,
Circle all of the following expression which are differential equations.

(i) $g'(x) + g(x) = 0$

(ii) $\left(\frac{d}{dt}\right)^5 f(t) + \frac{d}{dt}f(t) + f(t) = 0$

(iii) $\sin(x) \frac{d^2 f}{dx^2} + \frac{df}{dx} + e^x = \frac{d^3 f}{dx^3}$

(iv) ~~$y''' + y' + x$~~ Not an equation

(v) $f'(x) = f(x)$

(vi) $y^2 x = x^2$

(vii) $\csc(y'') + \sin(x) - y = 0$

(viii) $x^2 \frac{\partial^2 y}{\partial t^2} + y^2 \frac{\partial x}{\partial s} = s + t$

(ix) $e^{y''} + e^x = 3y$

(x) $x \frac{\partial^2 y}{\partial t^2} = y \frac{\partial x}{\partial s}$

2. (3 points) For the following equations, provide the dependent variable.

a. (1 pt) $f'(x) - f(x) = 0$ ~~$f(x)$~~

b. (1 pt) $\frac{d^2 g}{dt^2} - e^t g(t) = 3$ ~~g~~

c. (1 pt) $\sin(x)y' + y = 0$ ~~y~~ ?

$\frac{dx}{dt}$ & $\frac{dy}{dt}$ Dependent
 t Independent

3. (2 points) Consider the function $y = x^3$.

- a. (1 pt) Compute y' and y'' .

$[x^3]' = 3x^2$, $[x^3]'' \rightarrow [3x^2]' = 6x$

- b. (1 pt) Does y satisfy the differential equation $x^2 y'' - 5y = 0$? Justify your answer.

?

then check.