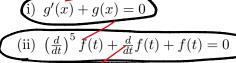
Please show and explain your work where necessary. Good luck!!

1. (5 points) For each of the following,

Circle all of the following expression which are differential equations.



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

(iv)
$$f'(x) = f(x)$$
 Not an equation

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

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

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

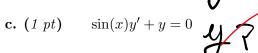
$$(ix) e^{y''} + e^x = 3y$$

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

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

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

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





- **3.** (2 points) Consider the function $y = x^3$.
 - **a.** (1 pt) Compute y' and y''.

$$\boxed{x3'=3x^2}, \boxed{x3''} \Rightarrow \boxed{3x^2}' = 6x$$

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