

## DERIVATIVE Note Cards

1) Use the definition of the derivative to find the derivative:

$$f(x) = 2x^2 + 4x$$

5) Use Implicit Differentiation to find the derivative:

$$2x^2y + 3xy^2 = 10$$

2) Find the derivative:

$$y = 3x^3(\cos x)$$

6) Find the slope of the tangent line of

$$2x^2 + 4xy + y^2 = 13 \text{ at the point } (1, 2)$$

3) Find the derivative:

$$y = x^2 \cos(3x - 1)$$

7) Find the derivative:

$$y = \sin^4(\sqrt{x})$$

4) Find the derivative:

$$y = \frac{1}{x^4} - \frac{1}{x^2} + x^2$$

8) Find the derivative:

$$y = \ln(\sqrt{\sin(2x)})$$

9) Find the derivative:

$$y = \frac{x-6}{x+6}$$

14) Find the derivative:

$$y = \frac{(x+2)^2 \sqrt[3]{x^2-4}}{(x^4-3)^5}$$

10) Find the value(s) of  $x$  when the equation has a horizontal tangent on  $y = 6x^3 - 2x^2 - 2x + 20$ .

15) Find the derivative:

$$y = e^{\sin^2(6x)}$$

11) Find the derivative:

$$y = x^2 \sqrt{3x+1}$$

12) Find the second derivative:

$$f(x) = x \ln x$$

13) Find the derivative:

$$y = \frac{\sin x}{\ln x}$$

## Answers

1)  $f'(x) = 4x + 4$

2)  $y' = 9x^2 \cos x - 3x^3 \sin x$

3)  $y' = 2x \cos(3x-1) - 3x^2 \sin(3x-1)$

4)  $y' = -\frac{4}{x^5} + \frac{2}{x^3} + 2x$

5)  $\frac{dy}{dx} = \frac{-3y^2 - 4xy}{2x^2 + 6xy}$

6)  $-\frac{3}{2}$

7)  $y' = \frac{2 \sin^3 \sqrt{x} \cos \sqrt{x}}{\sqrt{x}}$  or  $y' = \frac{2 \cos^4 \sqrt{x}}{4x^{3/4}}$

8)  $f'(x) = \cot 2x$

9)  $y' = \frac{12}{(x+6)^2}$

10)  $x = \frac{1 \pm \sqrt{10}}{9}$

11)  $y' = 2x\sqrt{3x+1} + \frac{3x^2}{2\sqrt{3x+1}}$

12)  $\frac{d^2y}{dx^2} = \frac{1}{x}$

13)  $f'(x) = \frac{x \cos x \ln x - \sin x}{x \ln^2 x}$

14)  $\frac{dy}{dx} = \left( \frac{2}{x+2} + \frac{2x}{3(x^2-4)} - \frac{20x^3}{x^4-3} \right) y$

15)  $y' = 12 \sin(6x) \cos(6x) e^{\sin^2(6x)}$