

Unit 2
Derivatives - Power Rule

Amman Modi
6th Period
9/10/2020

- 1) a) estimated $m_t = 1/2$ b) estimated slope ≈ 3

$$y' = \frac{1}{2\sqrt{x}} \text{ at } x=1$$

$$\frac{1}{2\sqrt{1}} = \boxed{\frac{1}{2}}$$

$$y' = 3x^2 \text{ at } x=1$$

$$3(1)^2 = \boxed{3}$$

2) $y' = 6x^5$

3) $f(x) = x^{1/5}$

$$f'(x) = \frac{1}{5}x^{-4/5} = \boxed{\frac{1}{5x^{4/5}}}$$

4) $f(t) = -2t^2 + 3t - 6$

$$f'(t) = -4t + 3$$

5) $S'(t) = 3t^2 - 2$

6) $y' = 2x + \frac{1}{2}\sin x$

7)

Original

$$y = \frac{5}{2x^2}$$

Rewrite

$$y = \frac{5}{2}x^{-2}$$

Diff.

$$y' = -5x^{-3}$$

Simplify

$$y' = -\frac{5}{x^3}$$

8

$$y = \frac{\sqrt{x}}{x}$$

$$y = \frac{1}{x^{1/2}}, \quad y = x^{-1/2}$$

$$y' = -\frac{1}{2}x^{-3/2}$$

$$y' = -\frac{1}{2x^{3/2}}$$

9) $f(x) = -\frac{1}{2} + \frac{7}{5}x^3$ $(0, -\frac{1}{2})$

$$f'(x) = \frac{21}{5}x^2 \text{ at } x=0$$

$$m = \frac{21}{5}(0)^2 = \boxed{0}$$

$$y - y_1 = m(x - x_1)$$

$$y + \frac{1}{2} = 0(x - 0)$$

10) $f(\theta) = 4\sin\theta - \theta$ $(0, 0)$

$$f'(\theta) = 4\cos\theta - 1$$

at $x=0$

$$4\cos(0) - 1 = 4 - 1 = \boxed{3}$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = 3(x - 0)$$

11)

$$g(t) = t^2 + 4/t^3$$

$$= t^2 - 4t^{-3}$$

$$g'(t) = 2t + 12t^{-4}$$

$$= \boxed{2t + \frac{12}{t^4}}$$

12) $y = x(x^2 + 1)$

$$= x^3 + x$$

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

$$13. h(s) = s^{4/5} - s^{2/3}$$

$$h'(s) = \frac{4}{5} s^{-1/5} - \frac{2}{3} s^{-1/3}$$

$$= \frac{4}{5 s^{1/5}} - \frac{2}{3 s^{1/3}}$$

$$14. y = x^4 - 3x^2 + 2$$

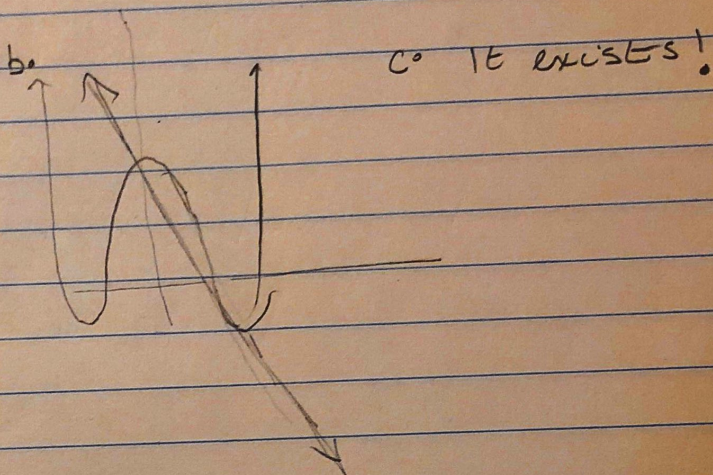
$$y' = 4x^3 - 6x$$

$$\text{at } x = 1$$

$$4(1)^3 - 6(1) = (-2) = m$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = -2(x - 1)$$



$$15. y = x^4 - 8x^2 + 2$$

$$y' = 4x^3 - 16x = 0$$

$$4x(x^2 - 4) = 0$$

$$x = 0, 2, -2$$

$$(0, 2), (2, -14), (-2, -14)$$

$$16. y = x + \sin x$$

$$y' = 1 + \cos x = 0$$

$$\cos x = -1$$

$$x = \pi$$

$$(\pi, \pi)$$

$$17. f(x) = \frac{k}{x}$$

$$= kx^{-1} = -kx^{-2}$$

$$f'(x) = -\frac{k}{x^2}$$

$$y' = -\frac{3}{4}$$

$$-\frac{3}{4} = -\frac{k}{x^2}$$

$$k = 3, x = 2$$

$$k = 3$$