CHAPTER-2 (Differentiation)

Name_____

PLEASE SHOW YOUR WORK AS NEATLY AS POSSIBLE :

1) Find the first and the second derivatives of the following functions :

a) $f(x) = \frac{5\sin(x)}{3} - x$

b) $y = \frac{x}{2} - \frac{\sin(2x)}{4}$

2) Find the derivative :

a) $y = \sec^2(\pi x)$

b) $y = \sin^2\left(\frac{x}{2}\right)$

3) $f(x) = \dfrac{2}{\sqrt{x+1}}$

a) Find the derivative, $f'(x)$.

b) Find the point on f where the slope of the tangent is $-\dfrac{1}{8}$.

4) Find all points $(x, f(x))$ on the graph of Let $f(x) = \dfrac{x^3}{3} - \dfrac{3x^2}{2} + 1$

a) Find the derivative.

b) Find all points $(x, f(x))$ on the graph of f(x) with tangent lines parallel to the line $8x - 2y = 1$

5) Given $f(x) = \dfrac{27}{x^2 + 2}$

a) Find the derivative, $f'(x)$.

b) Find the equation of the tangent line at $x = 1$

6) Given: $f(x) = 1 - \cos(2x) + \cos^2 x$

a) Find the derivative, $f'(x)$.

b) Determine the values of x in the interval $[0, 2\pi)$ at which the graph of $f(x)$ has a horizontal tangent lines.

7) Given : $6x^2 y - \pi \cos y = 7\pi$

a) Find dy/dx

b) Find the equation of the normal line at the point $(1, \pi)$

8) A 17-ft ladder is leaning against the side of a house. The top of the ladder is sliding down the house at rate of 5 ft/sec.

a) Determine how fast the bottom of the ladder is sliding away when the top of the ladder is 8 feet from the ground.
b) At what rate is the angle θ between the ladder and the ground is changing then.

9) A cube's surface area increases at a rate of 72 in^2 /sec . At what rate is the cube's Volume changing when the side's length is 3 inches ?

10) A water tank has the shape of an inverted right circular cone. The container has a radius of 2 m and a height of 4 m . If water is being pumped into the tank at a rate of 2 m^3/sec. Find the rate at which water level is rising when the water is 3 m deep.