

Answer the following questions. Each question counts 10 points.

Calculators are not allowed.

- (a) Let $f(x) = 2x^2 + 3$ use the definition of the derivative to find $f'(x)$
(b) If $f(x) = \sqrt{\sin x} - \sin \sqrt{x}$, find $f'(x)$
- (a) Use differentials to find an approximate value of $\sqrt[3]{999}$
(b) Find the equation of the tangent line to the graph of the equation : $x^2y + xy^2 = 12$ at the point $(3, 1)$
- (a) Find the horizontal and the vertical asymptotes for the graph of f , where

$$f(x) = \frac{|x-5|(x+7)}{x^2 - 5x + 6}$$

(b) Let:

$$f(x) = \begin{cases} \frac{2x^2 - x \sin x}{x^2} & \text{if } x < 0 \\ 2Ax + B & \text{if } 0 \leq x \leq 1 \\ \frac{x^3 - 1}{|x-1|} & \text{if } x > 1 \end{cases}$$

find the values of the constants A , and B such that the function f is continuous at $x = 0$ and $x = 1$.

- (a) A circular metal disc is heated so that its radius is increasing at the rate of 0.01 cm./min. Find the rate of change of its area when the radius is 50 cm.
- (b) State the Intermediate Value Theorem. Hence, show that the equation :

$$x^3 + 3x + 2 = 0 \text{ has } \geq \text{ real root.}$$

Good Luck