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DEPARTMENT OF MATHEMATICAL SCIENCES
2012/2013 RAIN SEMESTER
MAT 102: ELEMENTARY MATHEMATICS II
TEST 1

Instruction: Answer All

Time Allowed: 30 minutes

1.(a). Differentiate the following functions from the first principle:

(i) $y = x^2 + \frac{1}{x}$ (ii) $y = 2x^2 + 1$ (iii) $y = \sin x$ (iv) $y = x - \frac{1}{x^2}$

(b) If $t=1$, evaluate $\frac{ds}{dt}$ given that $S = 3t^3 + 2t^2 + t + 3$

2 (a) Show that the following function is continuous at the given point:

$$f(x) = \begin{cases} \frac{x^3 + 1}{x + 1}, & \text{for } x \neq -1 \\ 3, & \text{for } x = -1 \end{cases}$$

(b) Determine the values of a, b, c , for which the function

$$f(y) = \begin{cases} \frac{\sin(a+1)y + \sin y}{y}, & \text{for } y < 0 \\ c, & \text{for } y = 0 \\ \frac{(y + by^2) - y^{\frac{1}{2}}}{by^{\frac{1}{2}}}, & \text{for } y > 0 \end{cases}$$

is continuous at $y = 0$.

(c) Find the gradient at the point $x = 1$ on the curve $y = x^3 + x^2 - 3$

$$\begin{aligned} \frac{d}{dx} \left(x^3 + x^2 - 3 \right) &= \frac{d}{dx} x^3 + \frac{d}{dx} x^2 + \frac{d}{dx} (-3) \\ &= 3x^2 + 2x + 0 \\ &= 3x^2 + 2x \end{aligned}$$

$$\begin{aligned} y &= e^x \\ y + dy &= e^{x+dx} \\ dy &= e^{x+dx} - e^x \\ &= e^x + e^x dx - e^x \\ &= e^x dx \end{aligned}$$