

Serial No:

Student No.:

Name:

- 1. SHOW ALL WORK. NO CREDITS FOR ANSWERS NOT SUPPORTED BY WORK.**  
**2. CALCULATORS ARE NOT ALLOWED.**

**Problem 1 (25 Points):** If the limit exists find it. If it does not exist, say so; use  $\infty$  and  $-\infty$  when appropriate.

$$(a) \lim_{x \rightarrow 1} \frac{x-1}{x^2+x-2}$$

$$(b) \lim_{x \rightarrow 0^+} \frac{\sqrt{x}}{x+1} =$$

$$\lim_{x \rightarrow 0^-} \frac{\sqrt{x}}{x+1} =$$

$$\lim_{x \rightarrow 0} \frac{\sqrt{x}}{x+1} =$$

$$(c) \lim_{x \rightarrow -\infty} \frac{1-x^2+x^3}{x^2+x-5}$$

$$(d) \lim_{x \rightarrow \infty} [\sqrt{x+1} - \sqrt{x}]$$

**Problem 2 (25 Points)**

- (a) Use the definition of the derivative to find  $f'(x)$  for the function  $f(x) = 3x^2$ .
- (b) Find the equation of the line tangent to the graph of  $y = 3x^{-\frac{1}{3}} - 2x^{\frac{3}{2}}$  at the point (1, 1).
- (c) If the consumption function is  $C = 7 + 0.6I - 0.25\sqrt{I}$ , find the marginal propensity to save when  $I = 25$ .

**Problem 3 (25 Points)**

- (a) Find the value(s) of  $a$  which will make the function  $f(x)$  continuous.

$$f(x) = \begin{cases} \frac{x^2-4}{x-2} & \text{if } x \neq 2 \\ a-4 & \text{if } x = 2 \end{cases}$$

- (b) The demand equation of a certain product is  $p = \frac{1000}{q+5}$ , where  $p$  is the price per unit and  $q$

denotes the number of units available. If the revenue function is  $R(q) = pq$ .

- (i) Find the marginal revenue at  $q = 45$ .
- (ii) Estimate the revenue from selling unit number 46.
- (c) If  $y = \sqrt{e^x}$ , find  $y'(0)$ .

**Problem 4 (25 Points):**

- (a) Find the derivative of  $y = \log \sqrt{x^2+1}$ .

(b) If  $y = (1+x)^{\ln x}$  find  $y'$ .

(c) If  $x + xy + y = 5$ , find  $\frac{d^2y}{dx^2}$  at the point (2,1).