

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math - 132 Applied Calculus
Dr. M. Z. Abu-Sbeih

Test No. 1

October 12, 2005

Serial No:

Student No.:

Name:

1. **SHOW ALL WORK. NO CREDITS FOR ANSWERS NOT SUPPORTED BY WORK.**
2. **CALCULATORS ARE NOT ALLOWED.**
3. **DO ALL PROBLEMS. (There are 4 problems in 4 different pages)**
4. **DURATION OF EXAM: 9:00 – 9:10**

Problem 1 (20 Points): If the limit exists find it. If it does not exist, say so; use ∞ and $-\infty$ when appropriate.

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

(b) $\lim_{x \rightarrow 3} \frac{x - 3}{\sqrt{x + 6} - 3}$

(c) $\lim_{x \rightarrow 2^+} \frac{-x^2}{4 - x^2}$

(d) $\lim_{x \rightarrow -\infty} \frac{2x^2 + 41x - 19}{11 + 3x - 5x^2}$

Problem 2 (30 Points)

- (a) Use the definition of the derivative to find $f'(2)$ for the function $f(x) = x^3$.
- (b) Find the equation of the line tangent to the graph of $y = e^{x + \ln \sqrt{x+1}}$ at the point $(0, 1)$.
- (c) Find the slope of the line tangent to the graph of $xy + y^2 = e^x$ at the point $(0, 1)$.

Problem 3 (25 Points)

(a) Find all values of a and b which will make the function $f(x)$ continuous.

$$f(x) = \begin{cases} 1-x^2 & \text{if } x < 3 \\ b & \text{if } x = 3 \\ x+a & \text{if } x > 3 \end{cases}$$

(b) The demand equation of a certain product is $p = \frac{12}{q+10} + 2$, 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 $q = 10$.

(ii) Estimate the revenue from selling unit number 11.

(c) The saving function of a country is given by $S(I) = \frac{I-190}{\sqrt{I+10}}$, find the marginal propensity to consume when the income (I) is 390 billion SR.

Problem 4 (25 Points):

(a) If $y = u^3 - u + 2$ and $u = 4x - 2$, find $\frac{dy}{dx}$ when $x = 1$.

(b) Let $f(x) = \log_3(2^x + 1)$.

(i) Find $f'(x)$ (Simplify the answer).

(ii) Find the *percentage rate of change* of f with respect to x when $x = 3$.