King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math - 132 Applied Calculus

Test No. 1 | Dr. M. Z. Abu-Sbeih | March 19, 2006

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):

A. If the limit exists find it. If the limit does not exist, say so; use ∞ *and* $-\infty$ when appropriate.

(a) $\lim\limits_{x\to 1^-} \dfrac{x-1}{x^2-2x+1}$

(b) $\lim\limits_{x\to 0^+} \dfrac{x^2}{\sqrt{x^2+4}-2}$

(c) $\lim\limits_{x\to -\infty} \dfrac{5x^2-\sqrt{x}-9}{120x-3x^2}$

B. Let $f(x)=\begin{cases} 2x & \text{if } x<0 \\ 1 & \text{if } x=0 \\ x^2 & \text{if } x>0 \end{cases}$. For each of the following, find the limit. If the limit does not exist, say so; use ∞ *and* $-\infty$ when appropriate.

(i) $\lim\limits_{x\to 0^-} f(x)$

(ii) $\lim\limits_{x\to 0^+} f(x)$

(iii) $\lim\limits_{x\to 0} f(x)$

(iv) $\lim\limits_{x\to \infty} f(x)$

Problem 2 (25 Points)

(a) Use the definition of the derivative to find $f'(2)$ for the function $f(x)=5x-3$.

(b) Find the equation of the line tangent to the graph of $y=\left(\dfrac{2x^2}{1+x}\right)^4$ at the point (1, 1).

(c) Find all points on the graph of $y=x^3-3x^2+1$ where the slope is 0.

Problem 3 (25 Points)

(a) Find all value(s) of x for which the following function is ***discontinuous***.

$$f(x)=\begin{cases}\dfrac{1}{x^2-1} & if\ \ x<0\\ -1 & if\ \ x=0\\ x^2 & if\ \ x>0\end{cases}.$$

(b) The average cost $\bar{c}$ of producing q units of a product is given by $\bar{c}=\dfrac{4q}{q+2}+\dfrac{10000}{q}$. Find the marginal cost function.

(c) For the consumption function $C=10+\dfrac{5}{8}I-\dfrac{\sqrt{I}}{2}$,

a. find the marginal propensity to consume when I = 16;

b. find the marginal propensity to save when I = 16.

Problem 4 (25 Points):

(a) Find the derivative of $y=(x^2+9)\sqrt{x^3+4)}$ at x = 0.

(b) If $y=u^3+u^2+7u-2$ *and* $u=5x-6$, find $\dfrac{dy}{dx}$ when x = 1.

(c) Find the rate of change in the area of a circle with respect to the radius when the radius is 2 inches. Also find the relative rate of change in the area. ($A=\pi r^2$)