King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
Math 101(19) Class Test 1 Fall 2013(131)

ID#:_____ NAME:_____

(1) Evaluate the limit, if it exists:

(a) $\lim\limits_{x\to 1^-} \frac{|x^2-3x+2|}{x^2-1}$

(b) $\lim\limits_{x\to 2} \sqrt{\frac{x^4-16}{x^2-x-2}}$

(c) $\lim\limits_{x\to \frac{1}{2}} (\frac{2}{2x-1} - \frac{3}{2x^2+x-1})$

(d) $\lim_{x\to 1} \frac{5}{1-x}$.

(e) $\lim_{x\to 0^+} \frac{3}{x}(\frac{1}{4+x} - \frac{1}{4-x})$.

(f) $\lim_{x\to\infty} \frac{2x+x\cos x}{5x^2-2x+1}$.

(g) $\lim_{x\to 0^+} x\sin(\frac{\sqrt{x+2}}{x})$.

(2) Use the Intermediate Value Theorem to show that there is a root of the equation $x \ln x = \sin x$ between 1 and e.

(3) Use the graph of $f(x) = \frac{1}{x}$ to find a number δ such that $|\frac{1}{x} - \frac{1}{3}| < \frac{1}{5}$ whenever $|x - 3| < \delta$.

(4) The displacement (in meters) of a particle moving in a straight line is given by $s(t) = \frac{1}{\sqrt{5-t}}$ where t is measured in seconds. Use limits to find the instantaneous speed of the particle when $t = 1$.

(5) Sketch the graph of the function $f(x) = \frac{x^2+4}{x+2}$. Inculde the graphs and equations of the asymptotes and dominant terms.

(6) Find all values of a and a that makes the function

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

continuous on the real line. (Use limits to justify your steps)

(7) Find the horizontal asymptote(s) of the graph of the function

$$f(x) = \arctan \frac{\sqrt{x^2+2}}{x-7}.$$

(8) Sketch the graph of a function f that satisfies all of the given conditions:

$$\lim_{x\to -5^+} f(x) = \infty;\ \lim_{x\to -5^-} f(x) = -\infty;\ \lim_{x\to -\infty} f(x) = 0;\ \lim_{x\to -1} f(x) = 1;\ f \text{ is undefined at } -1;\ \lim_{x\to 2^-} f(x) = 0;\ \lim_{x\to 2^+} f(x) = 2;\ f(2) = 1.$$

(9) If $x^3 - x + 4 \leq x + f(x) \leq 3x^2 + 1$ for all real number x, then find $\lim_{x\to -1} f(x)$. (Given reasons to your steps)