King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
Math 101(10 & 16) Class Test I Summer 2017(163)

ID#:_____ NAME:_____

(1) Evaluate the limit, if it exists:

(a) $\lim\limits_{x\to 2^+} \frac{|x^2-3x+2|}{x^2-4}$.

(b) $\lim\limits_{x\to 0} \frac{x^2-x}{\sqrt{1+4x}-1}$.

(c) $\lim\limits_{x\to -\infty} (\cos(\frac{4\pi}{x}) \sin(\frac{4\pi}{x}))$

(d) $\lim\limits_{x\to \frac{1}{3}} (\frac{3}{3x-1} - \frac{4}{3x^2+2x-1})$.

(e) $\lim_{x\to 1} \frac{\sqrt[3]{x}-1}{\sqrt{x}-1}$.

(f) $\lim_{x\to \pi^+} [(x-\pi)\sin(\frac{\sqrt{x+2}}{x-\pi})]$.

(g) $\lim_{x\to -\infty} (-3x+1)^3(2x+1)^{122}$.

(h) $\lim_{x\to -1} [[\frac{1}{2}x - 1]]$, where $[[.]]$ denotes the greatest integer function.

(2) Use the Intermediate Value Theorem to show that the equation $x \ln x = \cos x$ has a solution.

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

(4) Let $f(x) = 2x+1$. Find the largest value of δ such that $|f(x)-7| < 0.01$ whenever $|x - 3| < \delta$.

(5) Sketch a graph of a function $f(x)$ that satisfies the following conditions:

1. $\lim_{x\to 2^+} f(x) = 0$;
2. $\lim_{x\to 2^-} f(x) = 2$;
3. $\lim_{x\to +\infty} f(x) = 4$;
4. $\lim_{x\to -\infty} f(x) = -1$;
5. $\lim_{x\to -2} f(x) = +\infty$;
6. $f(0) = 0$ and $f(2) = 1$.

(6) Consider the function $f(x) = \frac{2}{\sqrt{4-x}}$ and the point $P(0, f(0))$.

(i) Find the instantaneous rate of change of $f(x)$ with respect to x.

(ii) Find the slope of the graph of $y = f(x)$ at the point P.

(7)Find all values of a and b that makes the following function continuous:

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

(8) Let $f(x) = \frac{3-x}{\sqrt{x^2-9}}$. Using the concept of limit, find
(a) all horizontal asymptotes (if any)

(b) all vertical asymptotes (if any)

(9) If $\lim_{x\to m}[f(x)+g(x)]=4$ and $\lim_{x\to m}[f(x)-g(x)]=1$, find $\lim_{x\to m} f(x)g(x)$.