King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
Math 101(07 & 12) Class Test I Summer 2018(173)

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(1) Evaluate the limit, if it exists:

(a) $\lim\limits_{x \to 2^+} \frac{x^3-8}{|x^2-6x+8|}$.

(b) $\lim\limits_{x \to \infty} \frac{\cos^2(2x)}{3-2x}$

(c) $\lim\limits_{x \to 4} \frac{2-\sqrt{x}}{12-3x}$.

(d) $\lim\limits_{x \to \infty} \frac{x^2(2+\sin^2 x)}{x+100}$.

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(e) $\lim\limits_{x \to 0} \frac{x^3 - 7x}{x^3}$.

(f) $\lim\limits_{x \to 0^-} (\tan x - [[\tan x]])$, where $[[.]]$ denotes the greatest integer function.

(2) For $f(x) = 2x^3 + 4x^2 + 3x - 7$, show that there exists a number k such that $f(k) = 20$.

(3) Use the graph of $f(x) = \frac{1}{x+3}$ to find a number δ such that $|\frac{1}{x+3} - \frac{1}{4}| < \frac{1}{12}$ whenever $|x - 1| < \delta$.

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

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(5) For what values of x is the following function continuous ?

$$f(x) = \begin{cases} \frac{x^3 - 27}{x^2 - 9} & \text{if } x \neq 3 \\ \frac{9}{2} & \text{if } x = 3. \end{cases}$$

(6) For what values of x is the function $f(x) = \frac{e^{\sin x}}{4 - \sqrt{x^2 - 9}}$ continuous ?

(7) Let $f(x) = x - \sqrt{x^2 + 7}$. Using the concept of limit, find

(a) all horizontal asymptotes (if any)

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

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