KING SAUD UNIVERSITY

DEANSHIP OF THE FIRST YEAR COMMON

BASIC SCIENCES DEPARTMENT

MATH 101 HW # 3 / SECOND SEMESTER 1438-1439 Date: 08/03/2018

Question 1

9 Marks (1.5 each)

Find the following limits (if exists):

1. $\lim\limits_{x\to\frac{\pi}{2}}\left(\dfrac{\sin x}{x}+\dfrac{\cos x}{x-\frac{\pi}{2}}\right)$
2. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\cos x-\sin x}{4x-\pi}$
3. $\lim\limits_{x\to 2^{+}}\dfrac{x^2-5x+6}{\sqrt{x-2}}$
4. $\lim\limits_{x\to\infty}\dfrac{3x+\sin x}{4x-\cos(2x)}$
5. $\lim\limits_{x\to-\infty}\left(\sqrt{1+x+x^2}-x\right)$
6. $\lim\limits_{x\to\frac{\pi}{2}}\left(x-\dfrac{\pi}{2}\right)\tan x$

Answer:

Question 2 **4 Marks (2 + 2)**

Find the vertical and horizontal asymptotes (if any) for:

a. $f(x) = \dfrac{x}{\sqrt{9 - x^2}}$

b. $f(x) = \dfrac{\sin x}{x}$

Answer:

Question 3 **5 Marks: (2 + 3)**

a. Find the value of k such that

$$f(x) = \begin{cases} \dfrac{x^3 - 8}{x - 2}, & x \neq 2 \\ 3k + 1, & x = 2 \end{cases}$$

is continuous at $x = 2$.

b. Discuss the continuity of the function $f(x) = \sqrt{2x - 6}$.

Answer:

Question 4 **2 Marks**

Using **Intermediate Value Theorem**, show that $f(x) = x^4 - 6x + 1$ has at least one real root (zero).

Answer: