

KING SAUD UNIVERSITY
DEANSHIP OF COMMON FIRST YEAR
BASIC SCIENCES DEPARTMENT

MATH 101

HW # 2 / FIRST SEMESTER 1439-1440

Date: 25/10/2018

Question 1

6 Marks (2 each)

A. Use the definition of limit to show that:

$$\lim_{x \rightarrow -2} (-5x - 11) = -1$$

B. Determine the vertical and horizontal asymptotes of the function:

$$f(x) = \frac{4 - x^2}{x^2 - 4|x| + 4}$$

C. Find the values of a and b such that:

$$\lim_{x \rightarrow \infty} \left(\frac{2x^2 + 1}{x + 1} - ax + b \right) = 5$$

Question 2**16 Marks (2 each)**

Evaluate the following limits (if exists)

1. $\lim_{x \rightarrow 2} \frac{x-1}{x^2-1}$

2. $\lim_{x \rightarrow 9} \frac{x + \sqrt{x} - 12}{x - 9}$

3. $\lim_{x \rightarrow 1^+} \frac{x^2 - 1}{x^2 - 2x + 1}$

4. $\lim_{x \rightarrow 0} \frac{\sin^2 x + \sin(2x)}{3x}$

5. $\lim_{x \rightarrow 1} \left(\frac{2}{x^2 - 1} - \frac{1}{x - 1} \right)$

6. $\lim_{x \rightarrow \infty} \frac{\tan^{-1}(\sin x)}{x}$

7. $\lim_{x \rightarrow \infty} \frac{\sin^2 x}{x^2 + 1}$

8. $\lim_{x \rightarrow \infty} \left(x^2 \left(1 - \cos \frac{1}{x} \right) \right)$

Question 3**2 Marks**

Use the Intermediate Value Theorem to show that the equation $\cos x = x$ has a solution in $\left[0, \frac{\pi}{2}\right]$.

Question 4**2 Marks**

Let $f(x) = \begin{cases} cx^2 + d, & x > 1 \\ 6, & x = 1 \\ 2cx - d, & x < 1 \end{cases}$. Find the values of c and d such that f is continuous on \mathbb{R} .

Question 5

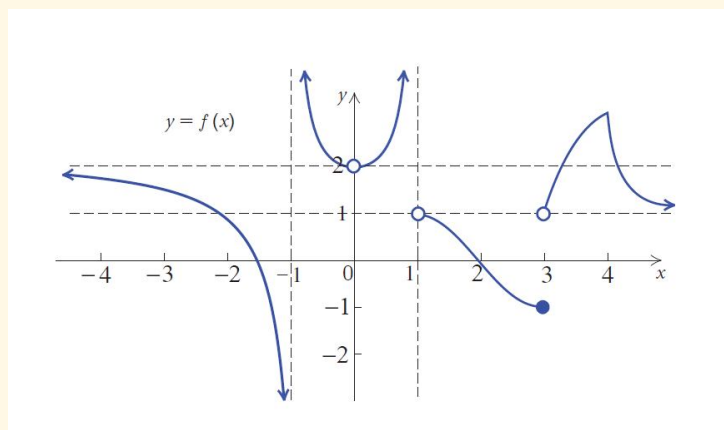
2 Marks

Discuss the differentiability of $f(x) = x|x|$ at $x = 0$.

Question 6

2 Marks (0.5 each)

Use the graph below of a function f to answer the following:



- A. Find the vertical asymptotes and horizontal asymptotes of f (state the reason).
- B. $\lim_{x \rightarrow 0} f(x)$
- C. $\lim_{x \rightarrow 1} f(x)$
- D. Determine the x -coordinate(s) in domain f at which the function is not differentiable.