

Serial No.: _____ Student Name: _____ Student Number: _____

Instructor: M. Z. Abu-Sbeih

Math 101- Q5

Date: 11-4-2019

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

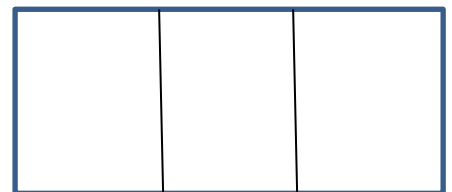
Problem 1 (10 points) Evaluate the limit if it exists

(a) $\lim_{x \rightarrow 0} \frac{x - \sin x}{x - \tan x}$

(b) $\lim_{x \rightarrow \infty} (1 + \ln x)^{\frac{1}{x}}$

Problem 2 (5 points) Determine whether the function $f(x) = x + \frac{1}{x}$ satisfies the hypotheses of the Mean Value Theorem on the interval $[1,5]$. If so, find all values of c that satisfy the conclusion of the theorem.

Problem 1 (5 points) A rectangular plot of land will be fenced into three equal parts by two dividing fences parallel to two sides (see the figure). If the area of the rectangle to be enclosed is 4000 m^2 , find the dimensions of the land that requires the least amount of fence.



Question 4: (20 points) Consider the function

$$y = f(x) = \frac{x^2}{x-2} \quad \text{with} \quad f'(x) = \frac{x^2 - 4x}{(x-2)^2} \quad \text{and} \quad f''(x) = \frac{8}{(x-2)^3}$$

a. (1 Points) Find the intercepts.

b. (3 Points) Find the asymptotes if any exist.

Horizontal:

Vertical:

Slant:

c. (2 Points) Find the critical numbers.

d. (4 Points) Find intervals where the function is increasing and those where it is decreasing.

e. (2 Points) Find the local maximum and local minimum of the function.

f. (2 Points) Discuss the concavity of the function and find the inflection points if any exist.

g. (6 Points) Sketch the graph of the function. Clearly indicate the **critical numbers**, **extrema** and **inflection points** on the graph.

