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

Instructor: M. Z. Abu-Sbeih Math 101- Q5 Date: 27-12-2016

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

Problem 1 (12 points; 4 points each)

a. Find the limit if it exists. Write ∞ or (- ∞) when appropriate: $\lim_{x \to 0} (1+\sin x)^{\frac{1}{x}}$

b. If $f(x) = \tanh(\sinh x)$ find $f'(0)$.

c. Let $f(x) = x^4 - 4x - 6$. Find a number *c* that satisfies the conclusion of the Mean Value Theorem on the interval [-1, 2] .

Question 2: (28 points) Consider the function

$y = f(x) = \dfrac{x-1}{x^2}$ with $f'(x) = \dfrac{2-x}{x^3}$ and $f''(x) = \dfrac{2(x-3)}{x^4}$

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

Horizontal:

Vertical:

Slant:

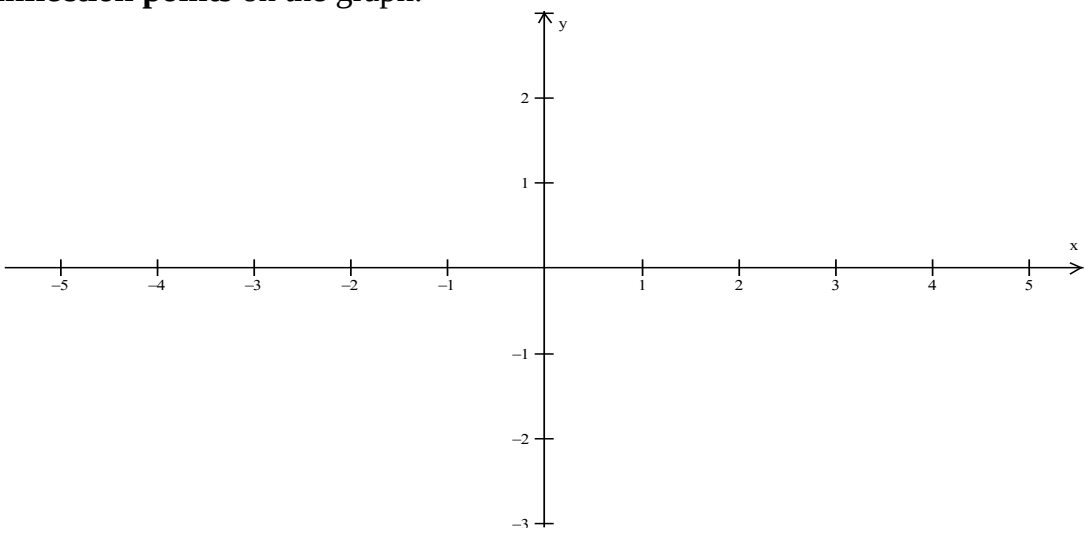
b. (2 Points) Find the critical numbers.

c. (6 Points) Find intervals where the function is increasing and those where it is decreasing.

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

e. (5 Points) Discuss the concavity of the function and find the infection points.

f. (8 Points) Sketch the graph of the function. Clearly indicate the **critical numbers**, **extrema** and **inflection points** on the graph.



g. (2 points) Find the absolute extrema of the function if exist.