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

Instructor: M. Z. Abu-Sbeih Math 101- Q5 Date: 26-4-2018

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

Problem 1 (6 points) Show that the function $f(x) = x\sqrt{x-1}$ satisfies the hypothesis of Rolle's Theorem on the interval [0,1]. Find all values of c that satisfy the conclusion of the theorem in that interval.

Problem 2 (12 points) Evaluate the limit if it exists. Use ∞ and/or - ∞ when appropriate.

a) $\lim_{x\to\infty} \frac{(lnx)^2}{x}$

b) $\lim_{x\to 0^+} (1+\sin x)^{\frac{1}{x}}$

Question 3: (24 points) Consider the function $y = f(x) = \frac{x^2}{x-1} = (x+1) + \frac{1}{x-1}$ with $f'(x) = \frac{x^2 - 2x}{(x-1)^2}$ and $f''(x) = \frac{2}{(x-1)^3}$

a. (2 Points) Find the intercepts.

b. (3 Points) Find the asymptotes if any exist. (**if no asymptote, say no asymptote**)
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. (4 Points) Find the local maximum and local minimum of the function.

f. (3 Points) Discuss the concavity of the function and find the infection 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.