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

Instructor: M. Z. Abu-Sbeih Math 101- Q2 Date: 7-10-2018

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

Show all your work. NO credits for answers not supported by work.

(1) (7 Points) Show that the equation $x^2 - x = \sin x$ has a solution between 1 and 2.

(2) (10 points) Consider the function $f(x) = \frac{1+\tan^{-1} x}{x^2-1}$.

a. Find all points of discontinuity (if any exists) and state the type of each one.

b. Find all vertical and horizontal asymptotes (if any exists) of the function.

(3) (13 points) Consider the function $f(x) = \frac{2}{x+1}$.

a. Use the definition of the derivative to find $f'(1)$

b. Find the equations of the tangent line and the normal lines to the curve at the point (1, 1).

c. Find the rate of change of the function at $x = 1$.

(4) (10 points) Consider the function $f(x) = \begin{cases} x^2 \sin\frac{1}{x} & \text{if } x \neq 0 \\ b+1 & \text{if } x = 0 \end{cases}$

Find all values of b which will make the function continuous at $x = 0$.