

Serial No.: \_\_\_\_\_ Student Name: \_\_\_\_\_ Student Number: \_\_\_\_\_

Instructor: M. Z. Abu-Sbeih

Math 101- Q2

Date: 10-2-2019

**SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS**

**Problem 2:** (20 points) (Justify your answers) Let

$$f(x) = \begin{cases} x + 1 & , \quad x \leq 1 \\ 1/x & , \quad 1 < x < 4 \\ \sqrt{4-x} & , \quad x \geq 4 \end{cases}$$

(a) Find  $\lim_{x \rightarrow 1} f(x)$

(b) Find  $\lim_{x \rightarrow 4} f(x)$

(c) Find all numbers at which  $f$  is discontinuous and state the type of discontinuity of each one.

(d) Find the numbers at which  $f$  is discontinuous but continuous from the left

(e) Find the numbers at which  $f$  is discontinuous but continuous from the right

(f) Show that the function is left –hand differentiable at  $x = 1$

**Problem 2:** (7 points) Find all horizontal asymptotes to the function  $f(x) = \sqrt{x^2 + 5} - x$

**Problem 3:** (7 points) Find the equation of the tangent line to  $y = \sqrt{x - 2}$  that is parallel to the line  $x - 2y = 2$  (Use the definition of the derivative)

**Problem 4:** (7 points) Consider the graph of the function  $f(x)$ . On the same graph, sketch the graph of  $f'(x)$

