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

Instructor: M. Z. Abu-Sbeih Math 101- Q2 Date: 26-2-2018

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

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

(1) (10 Points) Consider the function $f(x) = \frac{x^2-1}{x^2-x-2}$

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.

(2) (9 points) Find the equations of the tangent line and the normal lines to the curve $f(x) = \frac{2}{\sqrt{x+1}}$ at the point (3, 1). **Use the definition of the derivative.**

(3) (9 points) Find the horizontal asymptotes of each function:

a. If $f(x) = \sqrt{x^2 + 4} - x$

b. If $f(x) = \frac{\sqrt{4x^2+3} - x}{x-1}$

(4) (12 points) Consider the function $f(x) = \begin{cases} 2x - b & \text{if } x < 1 \\ x^2 & \text{if } x \geq 1 \end{cases}$

a. Find all values of *b* which will make the function continuous at $x = 1$.

b. Find all values of *b* which will make the function differentiable at $x = 1$.