

Serial No.: \_\_\_\_\_ Student Name: \_\_\_\_\_ Student Number: \_\_\_\_\_  
Instructor: M. Z. Abu-Sbeih Math 101- Q1 Date: 17-9-2019

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

**Problem 1:** (28 points) Find the limit if it exists. If it does not exist, show why. Use the symbols  $\infty$  or  $-\infty$  as appropriate.

a)  $\lim_{x \rightarrow -4} \frac{\sqrt{x^2 + 9} - 5}{x + 4}$

b)  $\lim_{x \rightarrow 1} (2 + x + 2 - x)$

c)  $\lim_{x \rightarrow 0} 2x^2 \sin\left(\frac{1}{x}\right) \cos\left(\frac{1}{x}\right)$

d)  $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} - \ln x \right)$

**Problem 2:** (6 points) If  $\lim_{x \rightarrow 0} \frac{e^x - f(x) + 5}{1 - \cos x} = 3$ , find  $\lim_{x \rightarrow 0} f(x)$  if it exists.

**Problem 3:** (6 points) Find all vertical asymptotes of the function  $f(x) = \frac{\ln x}{x - \sqrt{2+x}}$  if any exists.