

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

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Math 101- Q1

Date: 18-9-2018

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

Problem 1: (5 points) A particle is moving along a straight line with position function

$$s(t) = 2t - t^2 + 5.$$

- Find the average velocity over the time interval $[2, 2 + h]$.
- Estimate the instantaneous velocity at $t = 2$.

Problem 2: (20 points) Find the limit if it exists. If it does not exist, show why. Use the symbols ∞ or $-\infty$ as appropriate.

a) $\lim_{x \rightarrow 1} \frac{\sqrt{x^2 + 3x} - 2}{x - 1}$

b) $\lim_{x \rightarrow 0^+} (\ln x - \csc x)$

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

d) $\lim_{x \rightarrow 2} ([1+x] + [1-x])$

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

Problem 4: (5 points) Find all vertical asymptotes of the function $f(x) = \frac{(1-x)\ln x}{x^4 - 1}$ if any exists.

Problem 5: (5 points) Use the $\epsilon - \delta$ definition of limit to show that $\lim_{x \rightarrow 1} (1 - 2x) = -1$.

Find the maximum value for δ that correspond to $\epsilon = 0.01$