

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 4 (B)

Question 1. (4 marks) Evaluate the following limit:

$$\begin{aligned} \lim_{x \rightarrow 1} \frac{x-1}{x^3+x^2-2x} &= \lim_{x \rightarrow 1} \frac{x-1}{x(x^2+x-2)} = \lim_{x \rightarrow 1} \frac{x-1}{x(x-1)(x+2)} = \lim_{x \rightarrow 1} \frac{1}{x(x+2)} \\ &= \frac{1}{1(1+2)} = \frac{1}{3} \end{aligned}$$

Question 2. (6 marks) Determine where the following function is continuous. Explain your answer.

$$f(x) = \begin{cases} 2x-5 & \text{if } x < 2 \\ \frac{x+1}{x^2-9} & \text{if } x \geq 2 \end{cases}$$

$\frac{x+1}{x^2-9}$ IS DISCONTINUOUS WHEN $x^2-9=0 \Rightarrow x=\pm 3$. SINCE $f(x) = \frac{x+1}{x^2-9}$
 WHEN $x \geq 2$, f IS DISCONTINUOUS WHEN $x=3$. f IS A POLYNOMIAL
 OR A RATIONAL FUNCTION WITH NONZERO DENOMINATOR WHEN $x \neq 2, 3$ SO
 f IS CONTINUOUS THERE.

WHEN $x=2$

$$1) f(2) = \frac{2+1}{2^2-9} = \frac{3}{-5} = -\frac{3}{5}$$

$$2) \lim_{x \rightarrow 2^-} f(x) = \lim_{x \rightarrow 2^-} (2x-5) = 2(2)-5 = -1$$

$$\lim_{x \rightarrow 2^+} f(x) = \lim_{x \rightarrow 2^+} \frac{x+1}{x^2-9} = \frac{2+1}{2^2-9} = -\frac{3}{5}$$

$$\lim_{x \rightarrow 2^-} f(x) \neq \lim_{x \rightarrow 2^+} f(x) \text{ SO } \lim_{x \rightarrow 2} f(x) \text{ D.N.E.}$$

$\therefore f$ IS NOT CONTINUOUS AT $x=2$

$\therefore f$ IS CONTINUOUS EVERYWHERE EXCEPT $x=2, 3$