

Last Name: SOLUTIONS

First Name: _____

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Quiz 10B

Question 1. (5 marks) Use the second derivative test to find the relative extrema if any of

$$f(x) = 2x^3 + 3x^2 - 12x - 4$$

$$f'(x) = 6x^2 + 6x - 12$$

$$f'(x) = 0$$

$$6x^2 + 6x - 12 = 0$$

$$6(x^2 + x - 2) = 0$$

$$6(x+2)(x-1) = 0$$

$$x = -2, 1$$

$$f''(x) = 12x + 6$$

$$\bullet f''(-2) = 12(-2) + 6 = -18 < 0$$

$\therefore f(-2) = 16$ IS A RELATIVE MAXIMUM

$$\bullet f''(1) = 12(1) + 6 = 18 > 0$$

$\therefore f(1) = -11$ IS A
RELATIVE MINIMUM.

Question 2. (5 marks) Find the horizontal and vertical asymptotes of the function

$$f(x) = \frac{3x}{x^2 - x - 6}$$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0$$

$$x = -2, 3$$

$$f(-2) = 3(-2) = -6 \neq 0$$

$\therefore x = -2$ IS A VERTICAL
ASYMPTOTE

$$f(3) = 3(3) = 9 \neq 0$$

$\therefore x = 3$ IS A
VERTICAL ASYMPTOTE

$$\lim_{x \rightarrow \infty} \frac{3x}{x^2 - x - 6} = \lim_{x \rightarrow \infty} \frac{3/x}{1 - 1/x - 6/x^2}$$

$$= \frac{0}{1-0-0} = 0$$

$\therefore y = 0$ IS A
HORIZONTAL ASYMPTOTE.

$$\lim_{x \rightarrow -\infty} \frac{3x}{x^2 - x - 6} = \lim_{x \rightarrow -\infty} \frac{3/x}{1 - 1/x - 6/x^2}$$

$$= \frac{0}{1-0-0} = 0$$

$\therefore y = 0$ IS A
HORIZONTAL ASYMPTOTE.