

Last Name: SOLUTIONS

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## Quiz 10A

**Question 1.** (5 marks) Find the horizontal and vertical asymptotes of the function

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

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

$$\Rightarrow (x+2)(x-1) = 0$$

$$x = 1, -2$$

$$P(1) = 2(1) = 2 \neq 0$$

$\therefore x = 1$  IS A VERTICAL ASYMPTOTE

$$P(-2) = 2(-2) = -4 \neq 0$$

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

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

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

$\therefore y = 0$  IS A HORIZONTAL ASYMPTOTE

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

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

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

**Question 2.** (5 marks) Use the second derivative test to find the relative extrema if any of

$$f(x) = \frac{1}{3}x^3 - 2x^2 - 5x - 10$$

$$f'(x) = x^2 - 4x - 5 = 0$$

$$(x-5)(x+1) = 0$$

$$x = -1, 5$$

$$f''(x) = 2x - 4$$

$$f''(-1) = 2(-1) - 4 = -6 < 0$$

$\therefore f(-1) = -\frac{22}{3}$  IS A RELATIVE MAXIMUM

$$f''(5) = 2(5) - 4 = 16 > 0$$

$$\therefore f(5) = -\frac{130}{3}$$