

4. How to solve rational inequalities.

- Move all terms and fractions to one side of the inequality. Use the common denominator method to combine the fractions. Create a sign chart with the x-intercepts and vertical asymptotes listed across the top; label them each as V.A or x-int. List all factors of the numerator and denominator down the left. Use this to determine the intervals that satisfy the inequality.
- **Avoid using cross multiplication or multiplying through when solving rational inequalities. It can be done... but not easily.**

5. How to determine rates of change (average and instantaneous) given a rational function and be able to examine the function's graph to confirm that the rates are reasonable.

- Instantaneous rates of change cannot be determined at discontinuities (asymptotes and holes).
- Average rates of change cannot be determined if one of the two points occurs at a discontinuity.

Practice Questions

1. Graph the following

a) $f(x) = \frac{3x-9}{x^2-2x-3}$

$\frac{3(x-3)}{(x-3)(x+1)} = \frac{3}{x+1}$

b) $f(x) = \frac{2x-6}{x+5}$

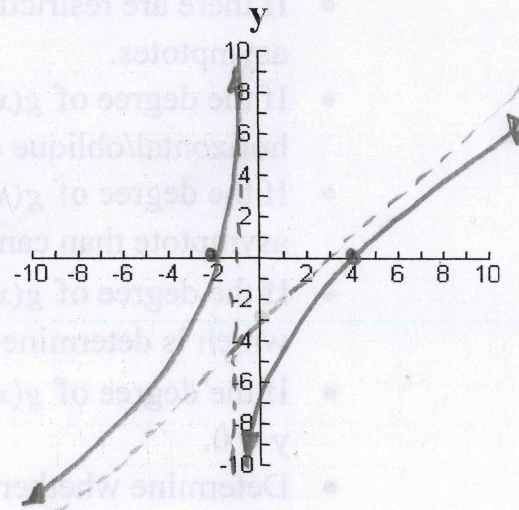
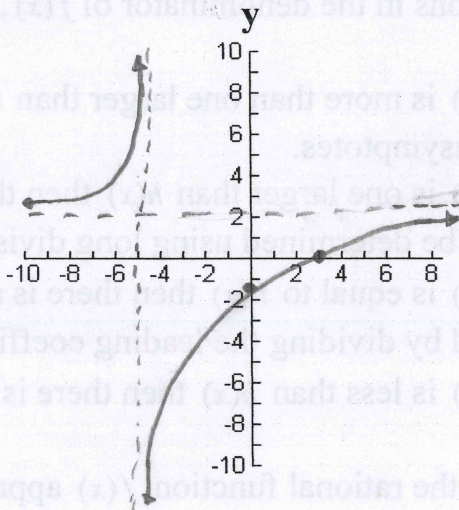
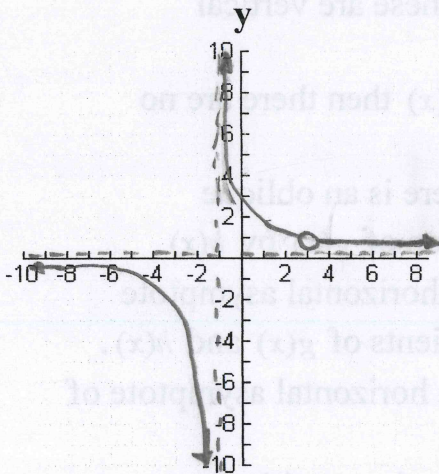
$\frac{2(x-3)}{(x+5)}$

c) $f(x) = \frac{x^2-2x-8}{x+1}$

$\frac{(x-4)(x+2)}{(x+1)}$

-1	1	-2	-8
		-1	3
		1	-3
			-5

O.A. $y = x - 3$



2. Solve the following.

a) $\frac{x+4}{x-1} = \frac{2x+4}{x+3}$

b) $\frac{3}{x} + \frac{x}{x+2} - \frac{1}{2x} = \frac{15x-2}{10x}$

c) $\frac{2}{x+3} \geq \frac{4}{x-1}$

3. Consider the function $f(x) = \frac{x-3}{x^2+x-20}$. Determine the rates of change...

a) at $x = 2$

b) at $x = 4$

c) in the interval $-2 \leq x \leq 0$

Additional Practice: pg 308 #1b, 2, *3, 4, 5ab, 6, 7, 9, 10, 11, 12a, 13ab, 14, 15a

1. See Page

$$2. a) \frac{x+4}{x-1} = \frac{2x+4}{x+3}$$

$$(2x+4)(x-1) = (x+4)(x+3)$$

$$2x^2 - 2x + 4x - 4 = x^2 + 3x + 4x + 12$$

$$x^2 - 5x - 16 = 0$$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-16)}}{2(1)}$$

$$= \frac{5 \pm \sqrt{25 + 64}}{2}$$

$$= \frac{5 \pm \sqrt{89}}{2}$$

$$x \approx 7.2 \text{ or } -2.2$$

$$b) \frac{3}{x} + \frac{x}{x+2} - \frac{1}{2x} = \frac{15x-2}{10x}$$

$$\frac{x}{x+2} = \frac{15x-2}{10x} - \frac{3}{x} + \frac{1}{2x}$$

$$\frac{x}{x+2} = \frac{15x-2}{10x} - \frac{30}{10x} + \frac{5}{10x}$$

$$\frac{x}{x+2} = \frac{15x-27}{10x}$$

$$15x^2 + 27x + 30x - 54 = 10x^2$$

$$5x^2 + 3x - 54 = 0 \quad P(-270) \left. \begin{array}{l} 18 \\ -15 \end{array} \right\}$$

$$5x^2 + 18x - 15x - 54 = 0$$

$$x(5x+18) - 3(5x+18) = 0$$

$$(x-3)(5x+18) = 0$$

$$x = 3 \text{ or } -\frac{18}{5}$$

(x-int) (VA) (VA)

	-7	-3	1
-2	-	-	-
x+7	-	+	+
x-1	-	-	+
x+3	-	-	+
	(+)	-	(+)

$$x \leq -7 \text{ or } -3 < x < 1$$

$$c) \frac{2}{x+3} \geq \frac{4}{x-1}$$

$$\frac{(x-1)(2)}{(x-1)(x+3)} - \frac{4(x+3)}{(x-1)(x+3)} \geq 0$$

$$\frac{2x-2-4x-12}{(x-1)(x+3)} \geq 0$$

$$\frac{-2x-14}{(x-1)(x+3)} \geq 0$$

$$\frac{-2(x+7)}{(x-1)(x+3)} \geq 0$$

$$3a) \text{IROC} \approx \frac{f(2.01) - f(2)}{0.01}$$

@x=2

$$\approx \frac{0.070968251 - 0.071428571}{0.01}$$

$$\approx -0.046$$

$$b) \text{IROC} \approx \frac{f(4.01) - f(4)}{0.01}$$

@x=4

undefined
@x=4

∴ There is no IROC at this point.

$$c) \text{AROC} = \frac{f(0) - f(-2)}{0 - (-2)}$$

$$= \frac{0.15 - 0.27}{2}$$

$$\approx -0.0639$$