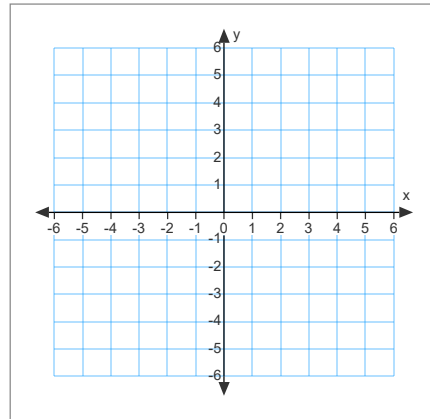


# 2.7 Non-Linear Inequalities.notebook

Warm up

1. Graph by hand using SIAID.

$$y = \frac{x - 2}{x^2 - 2x - 3}$$



Oct 9-7:47 AM

**GO COUGARS!**

### Homework Questions

**p 193**

In Exercises 1-10, find the domain of the function and identify any horizontal and vertical asymptotes.

1. $f(x) = \frac{x-2}{x^2-3x+2}$	4. $f(x) = \frac{x-2}{x^2-3x+2}$
2. $f(x) = \frac{x-2}{x^2-3x+2}$	5. $f(x) = \frac{x-2}{x^2-3x+2}$
3. $f(x) = \frac{x-2}{x^2-3x+2}$	6. $f(x) = \frac{x-2}{x^2-3x+2}$

In Exercises 11-20, find the sum of angle of the rational function.

11. $f(x) = \frac{x-2}{x^2-3x+2}$	15. $f(x) = \frac{x-2}{x^2-3x+2}$
12. $f(x) = \frac{x-2}{x^2-3x+2}$	16. $f(x) = \frac{x-2}{x^2-3x+2}$
13. $f(x) = \frac{x-2}{x^2-3x+2}$	17. $f(x) = \frac{x-2}{x^2-3x+2}$
14. $f(x) = \frac{x-2}{x^2-3x+2}$	18. $f(x) = \frac{x-2}{x^2-3x+2}$

In Exercises 21-30, find the domain of the function and identify any horizontal and vertical asymptotes.

21. $f(x) = \frac{x-2}{x^2-3x+2}$	25. $f(x) = \frac{x-2}{x^2-3x+2}$
22. $f(x) = \frac{x-2}{x^2-3x+2}$	26. $f(x) = \frac{x-2}{x^2-3x+2}$
23. $f(x) = \frac{x-2}{x^2-3x+2}$	27. $f(x) = \frac{x-2}{x^2-3x+2}$
24. $f(x) = \frac{x-2}{x^2-3x+2}$	28. $f(x) = \frac{x-2}{x^2-3x+2}$

In Exercises 31-40, use the domain of the function, the identity of intervals, to find any vertical and horizontal asymptotes, and plot additional solution points as needed to sketch the graph of the rational function.

31. $f(x) = \frac{x-2}{x^2-3x+2}$	35. $f(x) = \frac{x-2}{x^2-3x+2}$
32. $f(x) = \frac{x-2}{x^2-3x+2}$	36. $f(x) = \frac{x-2}{x^2-3x+2}$
33. $f(x) = \frac{x-2}{x^2-3x+2}$	37. $f(x) = \frac{x-2}{x^2-3x+2}$
34. $f(x) = \frac{x-2}{x^2-3x+2}$	38. $f(x) = \frac{x-2}{x^2-3x+2}$

**p 194**

In Exercises 1-10, use the domain of the function, the identity of intervals, to find any vertical and horizontal asymptotes, and plot additional solution points as needed to sketch the graph of the rational function.

1. $f(x) = \frac{x-2}{x^2-3x+2}$	5. $f(x) = \frac{x-2}{x^2-3x+2}$
2. $f(x) = \frac{x-2}{x^2-3x+2}$	6. $f(x) = \frac{x-2}{x^2-3x+2}$
3. $f(x) = \frac{x-2}{x^2-3x+2}$	7. $f(x) = \frac{x-2}{x^2-3x+2}$
4. $f(x) = \frac{x-2}{x^2-3x+2}$	8. $f(x) = \frac{x-2}{x^2-3x+2}$

**11. Answer:** The graph of the rational function is shown below.

**12. Answer:** The graph of the rational function is shown below.

**13. Answer:** The graph of the rational function is shown below.

**14. Answer:** The graph of the rational function is shown below.

**15. Answer:** The graph of the rational function is shown below.

**16. Answer:** The graph of the rational function is shown below.

**17. Answer:** The graph of the rational function is shown below.


**18. Answer:** The graph of the rational function is shown below.

**19. Answer:** The graph of the rational function is shown below.

**20. Answer:** The graph of the rational function is shown below.

Feb 2-9:51 PM

# 2.7 Non-Linear Inequalities.notebook

**GO COUGARS!** 

**Homework Questions**

p 194

In Exercises 53–54, (a) state the domain of the function, (b) identify all intercepts, (c) identify any vertical and slant asymptotes, and (d) plot additional solution points as needed to sketch the graph of the rational function.

53.  $f(x) = \frac{2x^2 + 1}{x}$

54.  $f(x) = \frac{x^2 - 1}{x + 2}$

55.  $f(x) = \frac{x^2}{x^2 - 1}$

56.  $f(x) = \frac{x^2 + 2x + 1}{x^2 - 1}$

57.  $f(x) = \frac{x^2 - 2x + 1}{x^2 + 2x + 1}$

58.  $f(x) = \frac{2x^2 - 2x + 1}{x^2 + 2x + 1}$

59.  $f(x) = \frac{2x^2 - 2x + 1}{x^2 + 2x + 1}$

73. **Problem** The cost  $C$  (in millions of dollars) of removing  $p\%$  of the industrial and municipal pollutants discharged into a river is given by

$$C = \frac{250p}{100 - p}, \quad 0 < p < 100.$$


(a) Use a graphing utility to graph the cost function. (b) Find the cost of removing 10%, 40%, and 75% of the pollutants.

(c) According to this model, would it be possible to remove 20% of the pollutants? Explain.

74. **Population Growth** The year 2000 census indicates that over one-eighth of the U.S. population lives in the West. The population of the West is modeled by


$$W = \frac{205 + 10t}{1 + 0.0001t^2}, \quad t \geq 0$$

where  $t$  is the time in years since 1990.



(a) Find the population when  $t = 1$ ,  $t = 10$ , and  $t = 25$ . (b) What is the limiting size of the West as time increases?

77. **Page Design** A page that is 8 inches wide and 9 inches high is to be printed on a page that is 10 inches wide and 12 inches high. The top and bottom margins are each 2 inches wide. The left and right margins are each 1 inch wide.



(a) Show that the total area  $A$  of the page is  $A = \frac{265 + 10t}{1 + 0.0001t^2}$ .

(b) Determine the domain of the function based on the physical situation of the problem.

(c) Use a graphing utility to graph the area function and approximate the page width for which the least amount of paper will be used. Verify your answer numerically using the calculator's graphing utility.

**True or False?** In Exercises 81 and 82, determine whether the statement is true or false. Justify your answer.

81. A polynomial can have relatively many vertical asymptotes.

82. The graph of a rational function can never cross one of its asymptotes.

**Think About It** In Exercises 83 and 84, write a rational function that has the specified characteristics. (There are many correct answers.)

83. Vertical asymptote:  $x = 2$

84. Vertical asymptote:  $x = -2$ ;  $x = 1$

Horizontal asymptote:  $y = 3$

In Exercises 85–90, (a) state the domain of the function, (b) identify all intercepts, (c) find any vertical and horizontal asymptotes, and (d) plot additional solution points as needed to sketch the graph of the rational function.

85.  $f(x) = \frac{x^2 - 1}{x + 2}$

86.  $f(x) = \frac{x^2 - 1}{x^2 + 2x + 1}$

87.  $f(x) = \frac{x^2 - 2x + 1}{x^2 + 2x + 1}$

88.  $f(x) = \frac{2x^2 - 2x + 1}{x^2 + 2x + 1}$

89.  $f(x) = \frac{2x^2 - 2x + 1}{x^2 + 2x + 1}$

90.  $f(x) = \frac{2x^2 - 2x + 1}{x^2 + 2x + 1}$

Feb 2-9:51 PM

## 2.7 Non-Linear Inequalities

Use critical numbers to solve:

polynomials

rational inequalities

Use critical numbers to find domains

Jul 19-4:58 PM

## 2.7 Non-Linear Inequalities.notebook

Graph  $f(x) = x^2 - 5x - 6$  on your calculator.

On what interval is  $f(x) < 0$ ?

under x-axis CN  $-1, 6$   ~~$x+1$~~   ~~$x-6$~~

How can we determine this algebraically?

Factor to find critical numbers

X Test  $-2$   $-$   $-$   $+$   
 $\checkmark$  test  $0$   $-$   $+$   $-$

Place numbers on number line in order

X test  $7$   $+$   $+$   $+$

Test a value in each interval

State the solution in interval notation

$(-1, 6)$

Jul 19-5:02 PM

Solve and state your answer in interval notation

$$x^2 - 5x - 6 < 0$$

$$3x^3 - 2x^2 - 12x + 8 > 0$$

$$x^2(3x-2) - 4(3x-2)$$

$$(x^2-4)(3x-2)$$

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

$$\text{CN } 2, -2, \frac{2}{3}$$

test here  $\rightarrow$

~~$x+2$~~   ~~$x-2$~~   ~~$x-\frac{2}{3}$~~   
 $-2$   $\frac{2}{3}$   $2$   
 $-3$   $0$   $1$   $3$   
 $-$   $+$   $-$   $+$   
 $\ominus$   $\oplus$   $\ominus$   $\oplus$

$$(-2, \frac{2}{3})(2, \infty)$$

Jul 19-5:05 PM

Some unusual solutions

$$x^2 + 6x + 9 \geq 0$$

$$(x+3)^2 \quad \begin{array}{c} | \\ -3 \quad 4 \\ \hline \end{array} \quad (-\infty, \infty)$$

$$x^2 + 4x + 4 \leq 0$$

$$(x+2)^2 \quad \begin{array}{c} -4 \quad 4 \\ -2 \quad +2 \\ + \quad + \\ \hline \end{array} \quad -2$$

$$x^2 + 5x + 7 < 0$$

$$\frac{-5 \pm \sqrt{25 - 4(1)(7)}}{2(1)} \quad \phi$$

$$x^2 - 6x + 9 > 0$$

$$(x-3)^2 > 0 \quad \begin{array}{c} \cup \\ | \\ \hline \end{array} \quad (-\infty, 3) \cup (3, \infty)$$

Sep 27-7:22 AM

Solve and state your answer in interval notation.

$$\frac{3x-5}{x-3} \leq 1$$

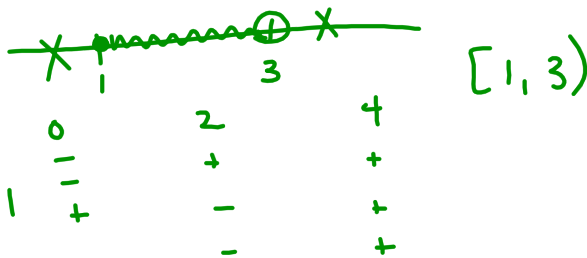
$$\frac{3x-5}{x-3} - 1 \leq 0$$

$$\frac{3x-5-(x-3)}{x-3} \leq 0$$

$$\frac{2x-2}{x-3} \leq 0$$

$$\frac{2(x-1)}{x-3} \leq 0$$

critical #'s 3, 1




Jul 24-6:23 AM

Find the domain (over the real numbers)

$$\sqrt{x^2 - 4}$$

$$x^2 - 4 \geq 0$$

$$(x-2)(x+2)$$

CN 

test


-3	0	3
-	-	+
-	-	+

$(-\infty, -2] \cup [2, \infty)$

$$\sqrt{\frac{x}{x^2 - 9}}$$

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

CN 0, -3, 3



test

-4	-2	2	4
-	-	+	+
-	-	+	+

$[-3, 0] \cup [3, \infty)$

Jul 24-6:25 AM

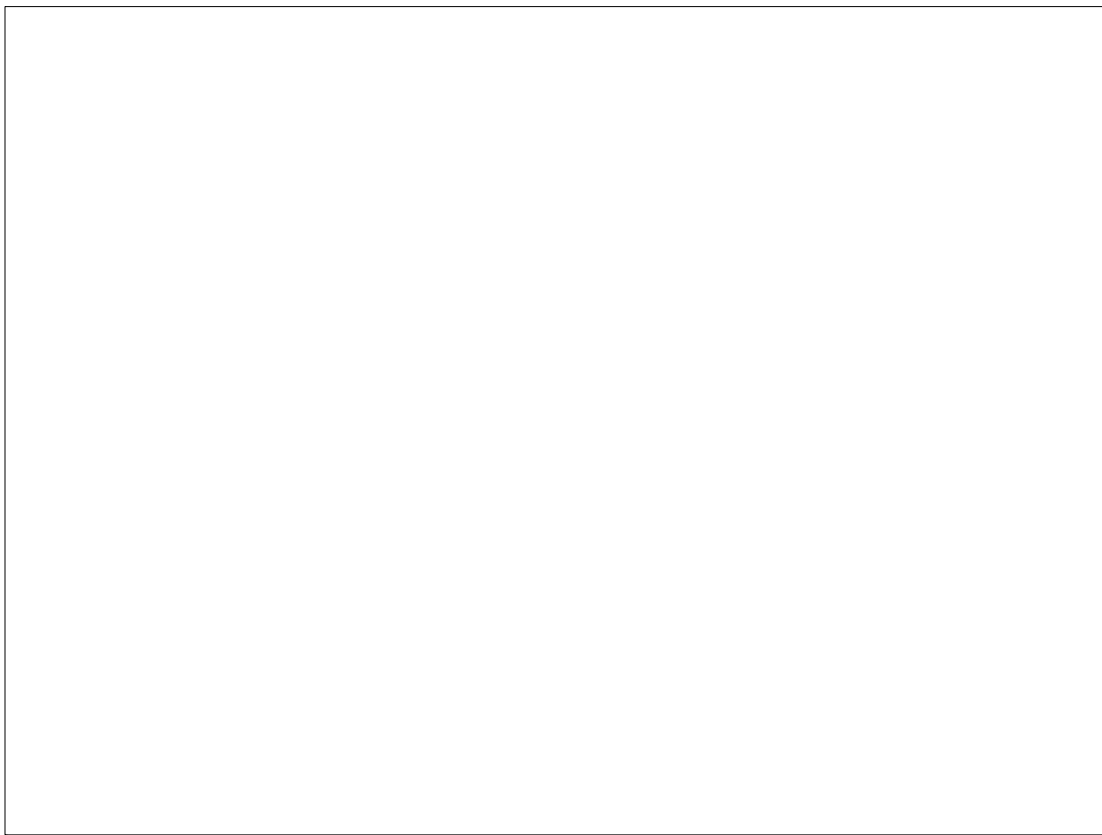
## HOMEWORK



p 204 9-13 odd, 23-27 odd, 39, 45,  
49, 55-63 odd

Feb 2-9:51 PM

## 2.7 Non-Linear Inequalities.notebook



Sep 27-7:21 AM