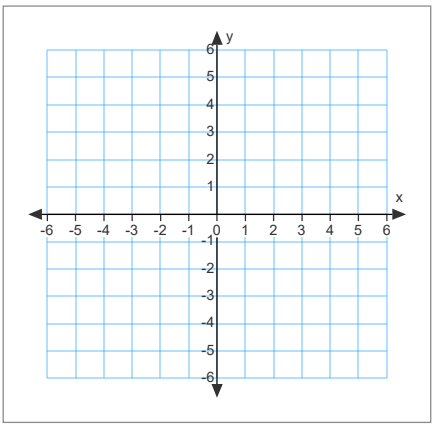
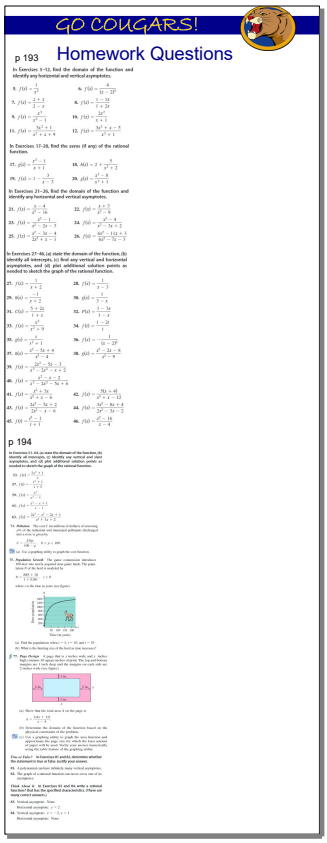
Warm up

1. Graph by hand using SIAID.

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



Oct 9-7:47 AM



Feb 2-9:51 PM

GO COUGARS!

p 194 Homework Questions

In Exercises 53–64, (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. $f(x) = \frac{2x^2 + 1}{x}$

57. $f(t) = \frac{t^2 + 1}{t + 5}$

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

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

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

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

$C = \frac{255p}{100 - p}, \quad 0 \le p < 100.$

(a) Use a graphing utility to graph the cost function.
(b) Find the costs of removing 10%, 40%, and 75% of the pollutants.
(c) According to this model, would it be possible to remove 100% of the pollutants? Explain.

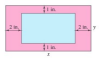
75. **Population Growth** The game commission introduces 100 deer into newly acquired state game lands. The population N of the herd is modeled by

$N = \frac{20(5 + 3t)}{1 + 0.04t}, \quad t \ge 0$

where t is the time in years (see figure).

(a) Find the populations when $t = 5$, $t = 10$, and $t = 25$.
(b) What is the limiting size of the herd as time increases?

77. **Page Design** A page that is x inches wide and y inches high contains 30 square inches of print. The top and bottom margins are 1 inch deep and the margins on each side are 2 inches wide (see figure).



(a) Show that the total area A on the page is

$A = \frac{2x(x + 11)}{x - 4}$

(b) Determine the domain of the function based on the physical constraints of the problem.
(c) Use a graphing utility to graph the area function and approximate the page size for which the least amount of paper will be used. Verify your answer numerically using the table feature of the 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 infinitely 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 f that has the specified characteristics. (There are many correct answers.)

83. Vertical asymptote: None
Horizontal asymptote: $y = 2$

84. Vertical asymptote: $x = -2$, $x = 1$
Horizontal asymptote: None

In Exercises 27–46, (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.

29. $h(x) = \frac{-1}{x + 2}$

33. $f(x) = \frac{x^2}{x^2 + 9}$

37. $h(x) = \frac{x^2 - 5x + 4}{x^2 - 4}$

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

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

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

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

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

$(x-6)(x+1)$

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

under x-axis CN $-1, 6$

How can we determine this algebraically?

- Factor to find critical numbers
- Place numbers on number line in order
- Test a value in each interval
- State the solution in interval notation

X Test -2 $-$ $-$ $+$

✓ test 0 $-$ $+$ $-$

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

$(-1, 6)$

Jul 19-5:02 PM

Solve and state your answer in interval notation

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

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

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

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

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

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

test here

-2 $\frac{2}{3}$ 2

-3 0 1 3

$-$ $-$ $-$ $+$ $-$ $+$ $+$ $+$

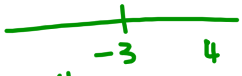
$(-2, \frac{2}{3})(2, \infty)$

Jul 19-5:05 PM

Some unusual solutions

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

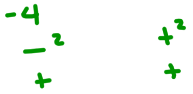
$(x+3)^2$



$(-\infty, \infty)$

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

$(x+2)^2$



-2

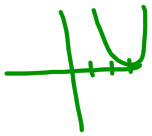
$x^2 + 5x + 7 < 0$

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

$\emptyset$

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

$(x-3)^2 > 0$



$(-\infty, 3)(3, \infty)$

Sep 27-7:22 AM

Solve and state your answer in interval notation.

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

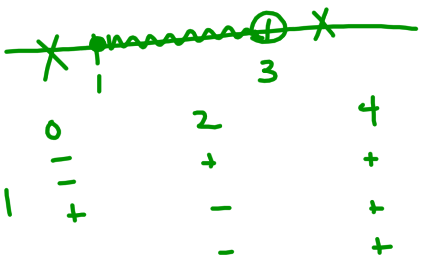
$\frac{3x-5}{x-3} - 1 \leq 0$

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

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

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

critical #'s 3, 1



$[1, 3)$

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 -2, 2

test	-3	0	3
	$-\cdot-=+$	$-\cdot+=-$	$+\cdot+=+$

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

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

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

CN $0, -3, 3$

test	-4	-2	2	4
	$-\cdot-=+$	$-\cdot+=-$	$+\cdot+=+$	$+\cdot+=+$

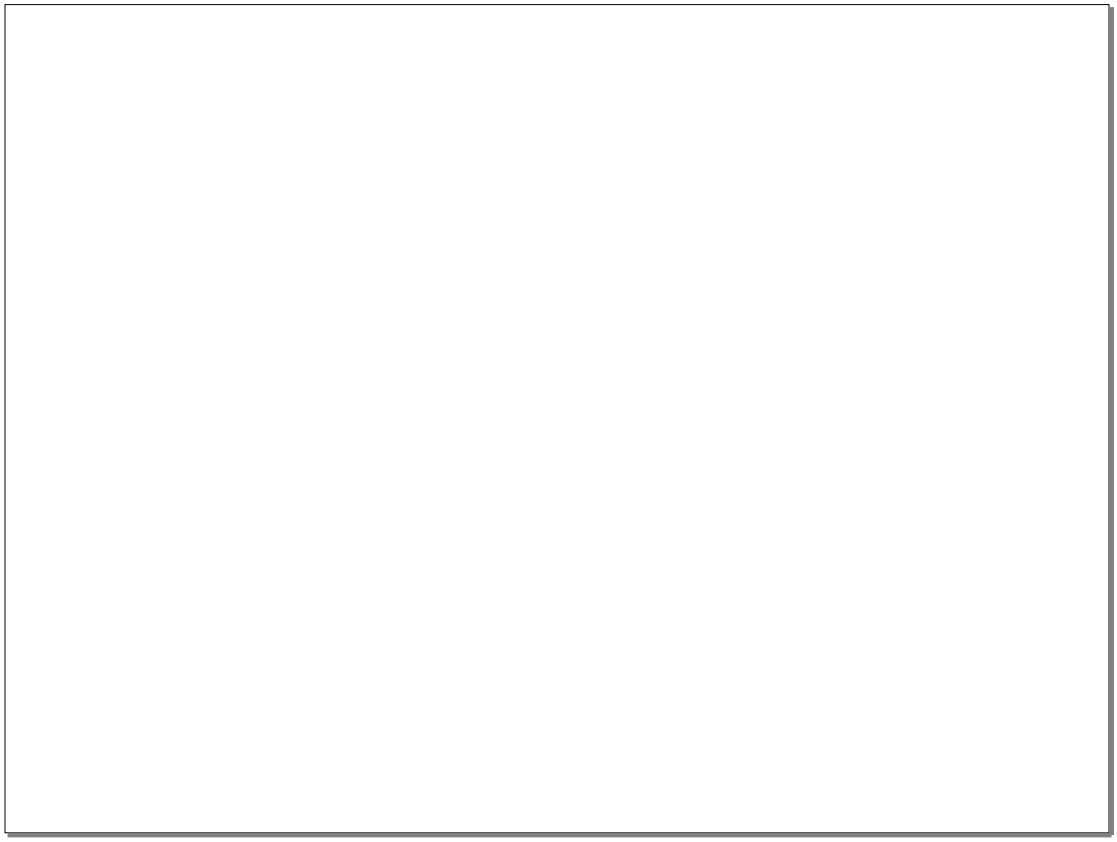
$[-3,0]\ [3,\infty)$

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



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