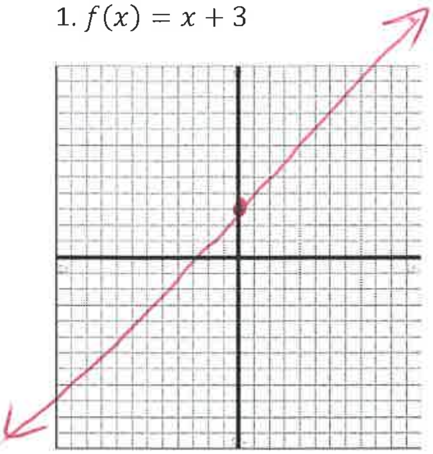
Algebra 2 Midterm Review

Chapter 1 Review

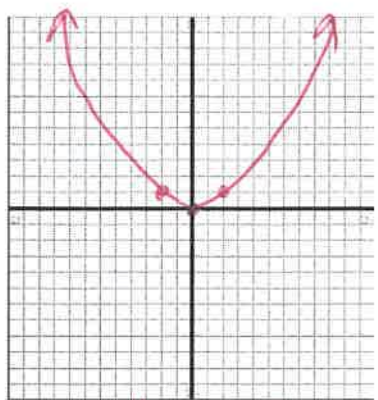
Graph the function and identify the function, then describe the transformations of functions.

1. $f(x) = x + 3$



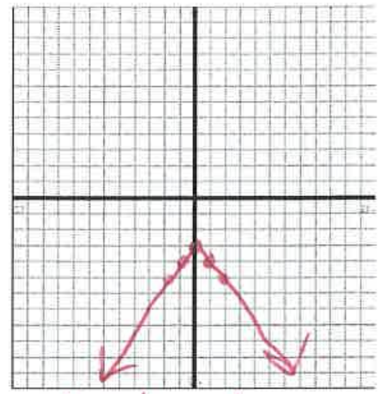
Linear, Up 3

2. $h(x) = \frac{1}{2}x^2$



Quadratic, Vert Shrink (wider)

3. $f(x) = -|x| - 3$



Absolute Value, Down 3 Reflection

4. Write a function g that is a translation 4 units right and 6 units down, followed by a reflection about the x-axis of the graph of $f(x) = -\frac{1}{2}(x+1)^2$.

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

$g(x) = -\frac{1}{2}(x-3)^2$

$g(x) = -\frac{1}{2}(x-3)^2 - 6$

$g(x) = \frac{1}{2}(x-3)^2 + 6$

Write a function *g* whose graph represents the indicated transformations of the graph of *f* for #5-8.

5. $f(x) = x$; vertical stretch by a factor of 3.

$f(x) = x$

$g(x) = 3x$

6. $f(x) = -3x + 4$; translation 3 units down followed by a reflection about the x-axis.

$f(x) = -3x + 4$

$g(x) = -3x + 1$

$g(x) = 3x - 1$

7. $f(x) = 2|x| - 9$; translation 2 units left and 6 units up followed by a vertical shrink by a factor of $\frac{1}{3}$.

$f(x) = 2|x| - 9$

$g(x) = 2|x+2| - 9$

$g(x) = 2|x+2| - 3$

$g(x) = \frac{2}{3}|x+2| - 1$

8. $f(x) = \frac{1}{2}(x+2)^2 - 5$; vertical stretch by a factor of 2 followed by a translation of 4 units right.

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

$g(x) = (x+2)^2 - 10$

$g(x) = (x-2)^2 - 10$

9. The total cost of an annual pass for admission to a national park plus camping for x days can be modeled by the function $f(x) = 20x + 80$. A senior citizen pays \$20 less than half of this price for x days. What is the total cost for a senior citizen to go camping for three days in the park?

switch order

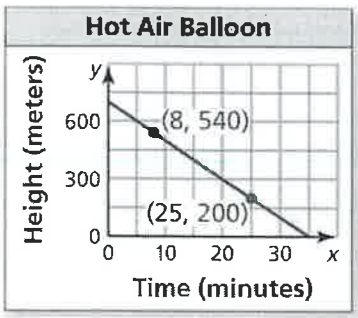
half first then −20

$f(x) = 20x + 80$

$g(x) = 10x + 40$

$g(x) = 10x + 20$

10. Use the graph to write an equation of the line and interpret the slope.



$\frac{540-200}{8-25} = \frac{340}{-17} = -20$

$y - 200 = -20(x - 25)$

$y - 200 = -20x + 500$

$y = -20x + 700$

Write the linear equation in slope-intercept form for each given set of information for #11-13.

11. $m = \frac{2}{3}$, $(3,6)$

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

$y - 6 = \frac{2}{3}x - 2$

$y = \frac{2}{3}x + 4$

12. $(-2,5), (-1,1)$

$\frac{5-1}{-2-(-1)} = \frac{4}{-1} = -4$

$y - 1 = -4(x + 1)$

$y - 1 = -4x - 4$

$y = -4x - 3$

13.

x	y
-4	2
-1	1
2	0
5	-1

$\frac{2-1}{-4-(-1)} = \frac{1}{-3}$

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

$y - 1 = -\frac{1}{3}x - \frac{1}{3}$

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

14. The table shows the numbers of ice cream cones sold for different outside temperatures (in degrees Fahrenheit). Do the data show a linear relationship? If so, write an equation of a line of fit and use it to estimate how many ice cream cones are sold when the temperature is 60°F.

STAT, EDIT, L_1, L_2, STAT, CALC, 4

Temperature, x	53	62	70	82	90
Number of cones, y	90	105	117	131	147

$y = 1.483x + 12.091$

Solve the system of equations.

15. $\begin{cases} -4x - 8y = -24 \\ 3x + 2y = 10 \end{cases}$ 3, 4

$-12x - 24y = -72$
$12x + 8y = 40$

$-16y = -32$
$y = 2$

$3x + 4 = 10$
$3x = 6$
$x = 2$

$(2, 2)$

16. $\begin{cases} y = \frac{1}{2}x + 3 \\ -x + 2y = -2 \end{cases}$

$(-\frac{1}{2}x + y = 3) -2$

$-x + 2y = -2$
$x - 2y = -6$

$0 = -8$

False

$\emptyset$

17. $\begin{cases} x + y + z = 3 \\ -x + 3y + 2z = -8 \\ x = 4z \end{cases}$

$4z + y + z = 3$
$(5z + y = 3) -3$
$-2z + 3y = -8$
$-15z - 3y = -9$

$-17z = -17$
$z = 1$

$5 + y = 3$
$y = -2$

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

$(4, -2, 1)$

$-4z + 3y + 2z = -8$
$-2z + 3y = -8$

18. $\begin{cases} x + 2y - 2z = 10 \\ -2x + y + 2z = -9 \\ 3x - 4y + 4z = -10 \end{cases}$) 2

$2x + 4y - 4z = 20$
$-2x + y + 2z = -9$

$5y - 2z = 11$
$-5y + 14z = -47$

$12z = -36$
$z = -3$

$5y + 6 = 11$
$5y = 5$
$y = 1$

$x + 2 + 6 = 10$
$x = 2$

$(2, 1, -3)$

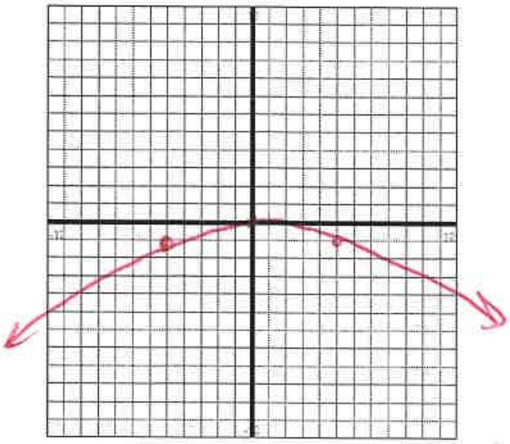
$-6x + 3y + 6z = -27$
$6x - 8y + 8z = -20$

$-5y + 14z = -47$

Chapter 2 Review

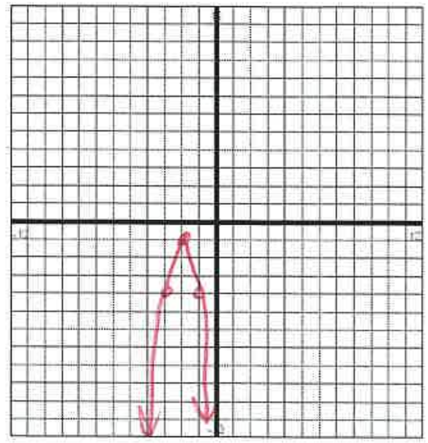
Describe the transformation of $f(x) = x^2$ represented by g. Then graph each function.

19. $g(x) = -\frac{1}{5}x^2$



Vertical Shrink, Reflection

20. $g(x) = -3(x + 2)^2 - 1$



Left 2, Down 1, Vert Stretch, Reflection

Write a rule for g.

21. The graph of g is a vertical stretch by a factor of 3, followed by a translation 5 units right of the graph $f(x) = x^2$.

$f(x) = x^2$

$g(x) = 3x^2$

$g(x) = 3(x-5)^2$

22. The graph of g is a translation 2 units left and 3 units up, followed by a refection about the x-axis of the graph $f(x) = x^2 - 2x$.

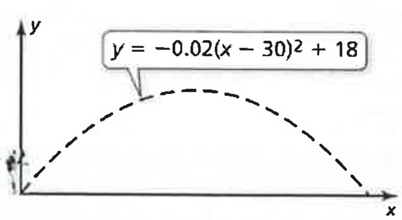
$f(x) = x^2 - 2x$

$g(x) = (x+2)^2 - 2(x+2)$

$g(x) = (x+2)^2 - 2(x+2) + 3$

$g(x) = -(x+2)^2 + 2(x+2) - 3$

23. The graph represents the path of a football kicked by a player, where x is the horizontal distance (in yards) and y is the height (in yards). The player kicks the ball a second time so that it travels the same horizontal distance, but reaches a maximum height that is 6 yards greater than the maximum height of the first kick. Write a function that models the path of the second kick.

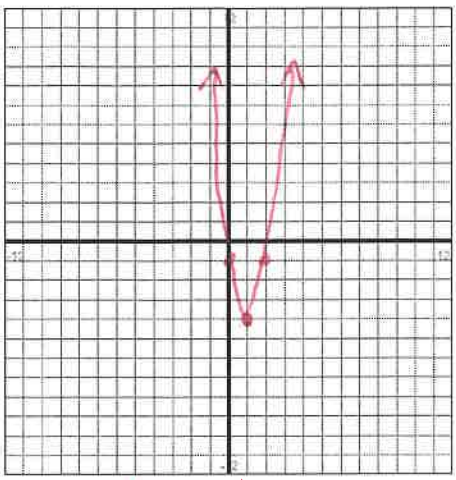


$y = -0.02(x-30)^2 + 18$

$y = -0.02(x-30)^2 + 24$

Graph the function. Label the vertex and axis of symmetry. Find the minimum value or maximum value of the function. Find when the function is increasing and decreasing.

24. $f(x) = 3(x-1)^2 - 4$

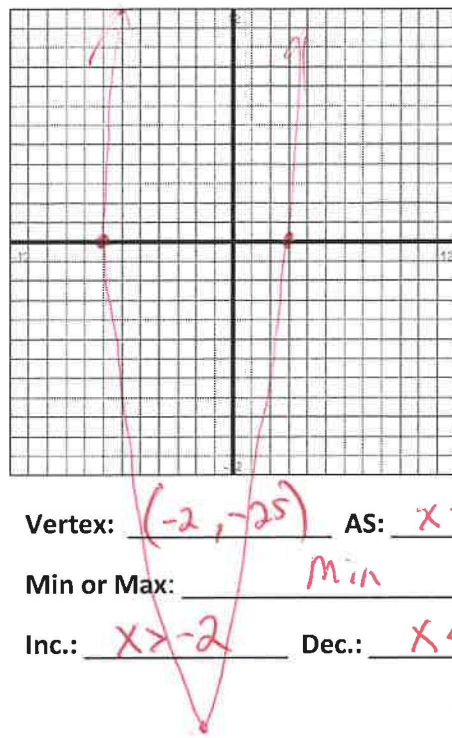


Vertex: $(1,-4)$ AS: $x=1$

Min or Max: Min

Inc.: $x > 1$ Dec.: $x < 1$

25. $h(x) = (x-3)(x+7)$



$\frac{-7+3}{2} = -2$

Vertex: $(-2,-25)$ AS: $x=-2$

Min or Max: Min

Inc.: $x > -2$ Dec.: $x < -2$

26. Write a quadratic function in standard form with a vertex of (3,2) and y-intercept of 20.

$(0, 20)$

$y = a(x-3)^2 + 2$

$20 = a(0-3)^2 + 2$

$20 = 9a + 2$

$18 = 9a$

$2 = a$ $\therefore$ $y = 2(x-3)^2 + 2$

Write the equation of the parabola with the given characteristics.

27. passes through (-2,3), and has a vertex of (-4,7)

$y = a(x+4)^2 + 7$

$3 = a(-2+4)^2 + 7$

$3 = 4a + 7$

$-4 = 4a$

$-1 = a$

$y = -(x+4)^2 + 7$

28. Passes through (4,3) and has x-intercepts -1 and 5

$y = a(x+1)(x-5)$

$3 = a(4+1)(4-5)$

$3 = -5a$

$-\frac{3}{5} = a$

$y = -\frac{3}{5}(x+1)(x-5)$

OR

$y = -\frac{3}{5}x^2 + \frac{12}{5} + 3$

29. passes through (-2,29), (1,-4), and (4,17)

STAT, EDIT, STAT, CALC, #5

$y = 3x^2 - 8x + 1$

30. The table shows the average total stopping distances of a vehicle on dry pavement at different speeds.

Speed (miles per hour), x	20	30	40	55	65	70
Total stopping distance (feet), y	63	119	164	265	344	387

a. Write the function that models the data.

b. Estimate the total stopping distance of a vehicle traveling 45 miles per hour.

TI-84

a. $y = 0.044x^2 + 2.37x + 0.740$

b. $y = 0.044(45)^2 + 2.37(45) + 0.740$

$y = 196.49$

Chapter P3 Review

Factor completely. If the polynomial is not factorable, write *prime*.

31. $x^2 + 10x - 39$

$(x+13)(x-3)$

32. $x^2 - 16$

$(x+4)(x-4)$

33. $8x^3 + 27$

$(2x+3)(4x^2-6x+9)$

34. $18x^3 + 3x^2 - 3x$

$x(18x^2+3x-3)$

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

35. $x^2 + 16x + 64$

$(x+8)(x+8)$

$(x+8)^2$

36. $9x^2 - 30x + 16$

$(3x-2)(3x-8)$

37. $25x^2 + 36$

Prime

38. $25x^4 - 10x^3 - 5x + 2$

$5x^3(5x-2) - 1(5x-2)$

$(5x^3-1)(5x-2)$

39. $4x^2 + 13x - 12$

$(x+4)(4x-3)$

40. $x^2 - 12x - 28$

$(x+2)(x-14)$

41. $-8x^2 + 6x + 5$

$-1(8x^2-6x-5)$

40 → 4, −10

$\frac{8x^2}{4x}$ $\frac{8x^2}{-10x}$

$-1(2x+1)(4x-5)$

42. $x^3 - 1$

$(x-1)(x^2+x+1)$

Chapter 3 Review

Solve the equation using any method.

43. $2x^2 - 17x = 30$

$2x^2-17x-30=0$

60 → 3, −20

$\frac{2x^2}{3x}$ $\frac{2x^2}{-20x}$

$(2x+3)(x-10)=0$

$x = -\frac{3}{2}, 10$

44. $2(x+2)^2 - 5 = 8$

$2x^2+8x+8-5=8$

$2x^2+8x-5=0$

$\frac{-8 \pm \sqrt{64-4(2)(-5)}}{4}$

$\frac{-8 \pm \sqrt{104}}{4} = \frac{-8 \pm \sqrt{4 \cdot 26}}{4} = \frac{-8 \pm 2\sqrt{26}}{4} = \frac{-4 \pm \sqrt{26}}{2}$

45. $x^2 + 17x + 16 = 0$

$(x+1)(x+16)=0$

$x = -1, -16$

46. $2x^2 + 5x = 3$

$2x^2+5x-3=0$

6 → 6, −1

$\frac{2x^2}{6x}$ $\frac{2x^2}{-x}$

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

$x = -3, \frac{1}{2}$

47. $3x^2 - 12x + 13 = 0$

$\frac{12 \pm \sqrt{144-4(3)(13)}}{2(3)}$

$\frac{12 \pm \sqrt{-12}}{6}$

$\frac{12 \pm \sqrt{-1 \cdot 4 \cdot 3}}{6}$

$\frac{12 \pm 2i\sqrt{3}}{6} = \frac{6 \pm i\sqrt{3}}{3}$

48. $(x-4)^2 = 49$

$x-4 = \pm 7$

$x-4=7 \quad x-4=-7$

$x = 11 \quad x = -3$

Find the zeros.

49. $f(x) = 3x^2 - 6x + 3$

TI 84 2nd Graph T-chart

1

50. $h(x) = 3x^2 - 12$

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

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

$-2, 2$

51. $g(x) = x^2 - 2x + 2$

TI-84

does not intersect x-axis

$\emptyset$

Perform the operation. Write the answer in standard form.

52. $(9+3i)-(-2-7i)$

$11+10i$

53. $(8+2i)(8-2i)$

$64-16i+16i-4i^2(-1)$

68

54. $(10-i)+(6+4i)$

$16+3i$

55. $(2+i)(5-3i)$

$10-6i+5i-3i^2$

$13-i$

56. $(1+2i)^2$

$(1+2i)(1+2i)$

$1+2i+2i+4i^2(-1)$

$-3+4i$

57. $(-2+3i)-(4+i)$

$-6+2i$

58. Dustin Johnson hits a golf ball and the height of the ball, *h,* in feet, after *t* seconds, obeys the equation

$h=-16t^2+88t+0.25.$

a. What is the initial height of the ball? Does this make sense? $h(0)=0.25$ (3 in) Yes on the tee

b. At what time does the ball reach its maximum height? What is the maximum height of the ball? TI 84 2nd Trace 4 (max) 2.75 sec, 121.25 ft

c. When does the ball hit the ground?

TI-84
add $y=0$
2nd trace
#5
5.5 seconds

59. You kick a kickball. The path of the ball is represented by $y=x(0.6-0.02x)$, where *x* is the horizontal distance (in feet) and *y* is the corresponding height (in feet). Your second kick reaches a maximum height of 7 feet, 12 feet away from you.

a. Which kick travels higher? Second

b. Which kick travels farther before hitting the ground? first

$y=0.6x-0.02x^2$

$y=-0.02x^2+0.6x$

TI-84

Vertex (15, 4.5)

Height 4.5 feet

15 feet away

Solve the system by any method.

60. $\begin{cases} x^2 - 6x + 13 = y \\ y = 2x - 3 \end{cases}$

Sub

$x^2 - 6x + 13 = 2x - 3$

$x^2 - 8x + 16 = 0$

$(x-4)(x-4) = 0$

$x = 4$

$(4, 5)$

61. $\begin{cases} 2x - 3 = y + 5x^2 \\ y = -3x - 3 \end{cases}$

Elim

$2x - 3 = y + 5x^2$

$3x + 3 = -y$

$5x = 5x^2$

$0 = 5x^2 - 5x$

$0 = 5x(x-1)$

$5x = 0 \quad x - 1 = 0$

$x = 0 \quad x = 1$

$(0, -3)(1, -6)$

62. $\begin{cases} x^2 + y^2 = 5 \\ -x + y = -1 \end{cases}$

TI-84

$y = \sqrt{-x^2 + 5} \quad y = -\sqrt{-x^2 + 5}$

$y = x - 1$

2nd CALC, INTERSECT

$(2, 1)(-1, -2)$

63. $\begin{cases} -3x^2 + 2x - 5 = y \\ -x + 2 = -y \end{cases}$

Elim

$-3x^2 + x - 3 = 0$

$0 = 3x^2 - x + 3$

$\frac{1 \pm \sqrt{1 - 4(3)(3)}}{2(3)}$

$\frac{1 \pm \sqrt{-35}}{6}$

$\varnothing$

64. $-1\left(\begin{cases} y = -x^2 - 6x - 10 \\ y = 3x^2 + 18x + 22 \end{cases}\right)$

Elim

$0 = 4x^2 + 24x + 32$

$0 = 4(x^2 + 6x + 8)$

$0 = 4(x+2)(x+4)$

$x = -2 \quad x = -4$

$(-2, -2)\ (-4, 2)$

65. $\begin{cases} y = 0.5x^2 - 10 \\ -1(y = -x^2 + 14) \end{cases}$

Elim

$0 = 1.5x^2 - 24$

$\frac{0 \pm \sqrt{0 - 4(1.5)(-24)}}{2(1.5)}$

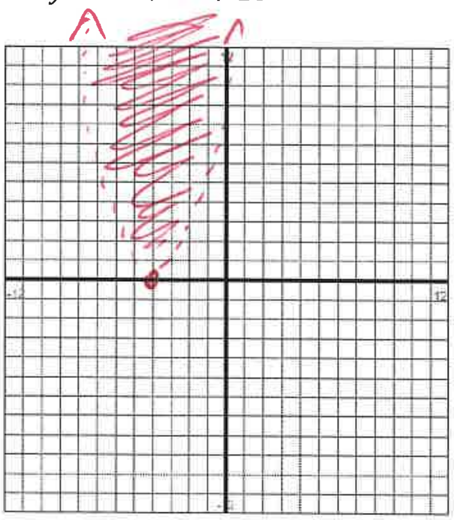
$\frac{0 \pm \sqrt{144}}{3}$

$4, -4$

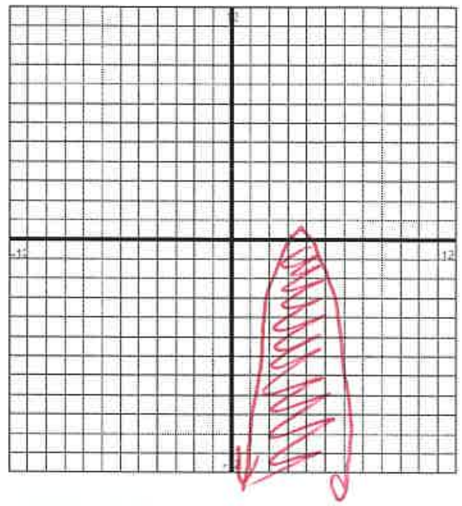
$(4, -2)(-4, -2)$

Graph the inequality.

66. $y > x^2 + 8x + 16$

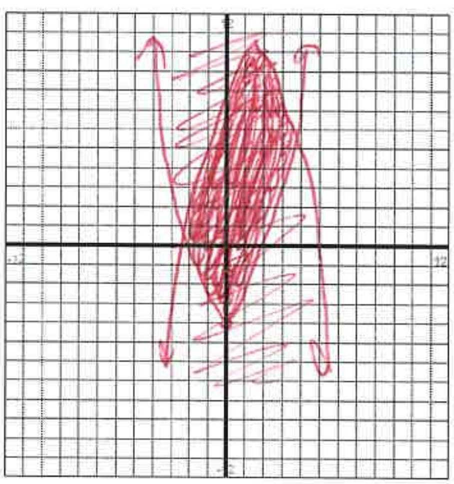


67. $x^2 + y \le 7x - 12$

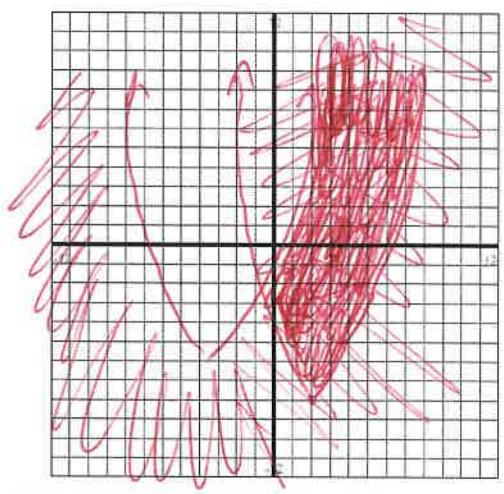


Graph the system of inequalities.

68. $\begin{cases} y \ge x^2 - 4 \\ y \le -2x^2 + 7x + 4 \end{cases}$



69. $\begin{cases} y \ge x^2 - 3x - 6 \\ y \le x^2 + 7x + 6 \end{cases}$



Solve the inequality. GO LA!

70. $-x^2 - 10x < 21$

$0 < x^2 + 10x + 21$

$x^2 + 10x + 21 > 0$

$(x+3)(x+7) > 0$

+ −7 − −3 +

$x < -7$ or $x > -3$

71. $x^2 + 10x + 9 < 0$

$(x+1)(x+9) < 0$

+ −9 − −1 +

$x > -9$ and $x < -1$

$-9 < x < -1$

72. $4x^2 + 8x - 21 \ge 0$

84, 14 −6

$\frac{4x^2}{14x}$ $\frac{4x^2}{-6x}$

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

+ $-\frac{7}{2}$ − $\frac{3}{2}$ +

$x < -\frac{7}{2}$ or $x > \frac{3}{2}$