Chapter 5 Review Questions

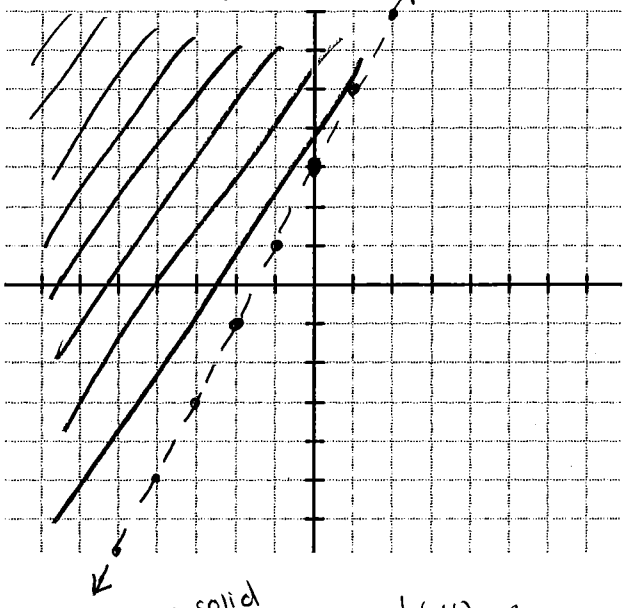
Name KEY

1. Graph the following inequalities.

a) $-2x + y > 3$

dotted

$y > 2x + 3$



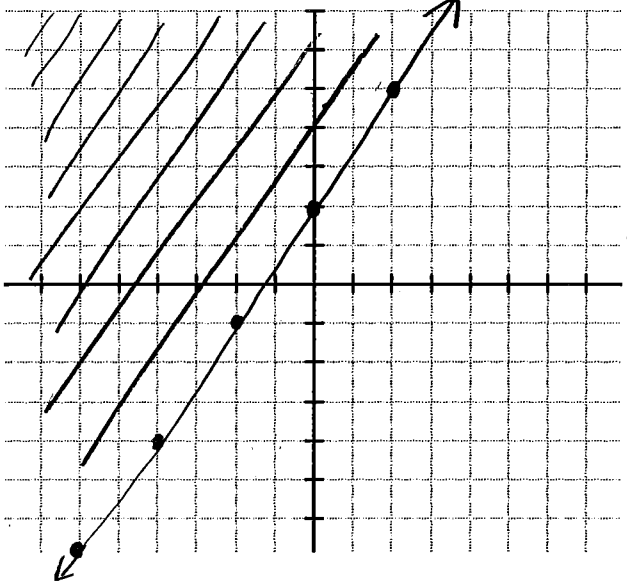
Test (0,0):
$-2(0) + 0 > 3$
$0 > 3$
×

b) $3x - 2y + 4 \leq 0$

$3x + 4 \leq 2y$

$\frac{3}{2}x + 2 \leq y$

solid

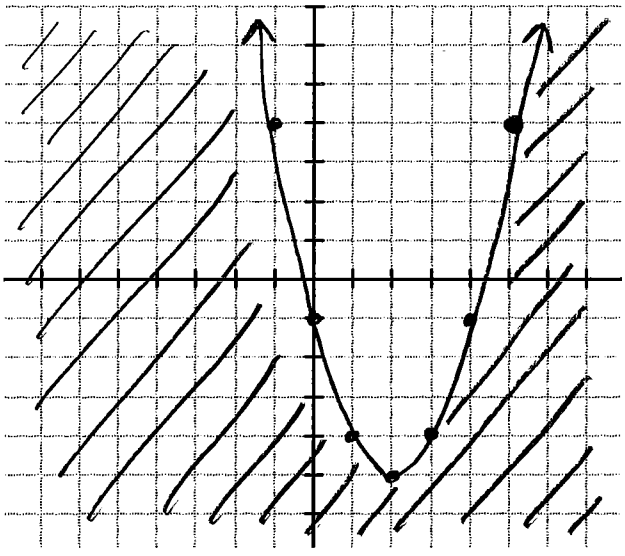


Test (0,0):
$3(0) - 2(0) + 4 \leq 0$
$4 \leq 0$
×

c) $y \leq x^2 - 4x - 1$

solid

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



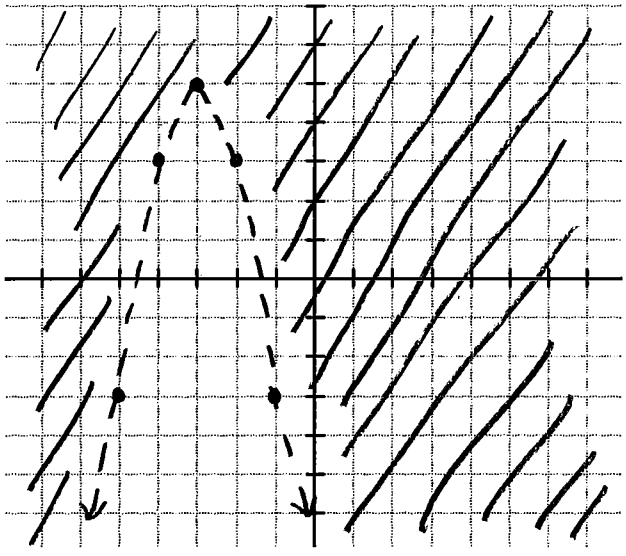
$y \leq x^2 - 4x + 4 - 4 - 1$

$y \leq (x-2)^2 - 5$

Test (0,0):
$0 \leq 0^2 - 4(0) - 1$
$0 \leq -1$
×

d) $y > -2x^2 - 12x - 13$

dotted



$y > -2(x^2 + 6x) - 13$

$\frac{1}{2}(6) = 3$
$\hookrightarrow 3^2 = 9$

$y > -2(x^2 + 6x + 9 - 9) - 13$

$y > -2(x+3)^2 + 18 - 13$

$y > -2(x+3)^2 + 5$

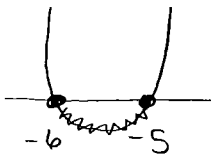
Test (0,0):
$0 > 0 - 0 - 13$
$0 > -13$
✓

2. Solve the following quadratic inequalities. (Draw a rough sketch—it will help)

a) $x^2 + 11x + 30 < 0$

$(x+6)(x+5) < 0$

$x = -6 \quad x = -5$



$-6 < x < -5$

b) $-4x^2 + x < -5$

$+4x^2 - x \quad +4x^2 - x$

$0 < 4x^2 - x - 5$

$4(-5) = -20$

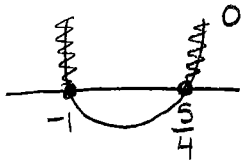
$-5 \quad +4$

$0 < 4x^2 - 5x + 4x - 5$

$0 < x(4x-5) + (4x-5)$

$0 < (x+1)(4x-5)$

$x = -1 \quad x = 5/4$



$x < -1 \text{ , } x > \frac{5}{4}$

c) $3x^2 > 16x - 5$

$-16x + 5$

$3(5) = 15$

$-15 \quad -1$

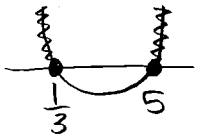
$3x^2 - 16x + 5 > 0$

$3x^2 - 15x - x + 5 > 0$

$3x(x-5) - (x-5) > 0$

$(3x-1)(x-5) > 0$

$x = \frac{1}{3} \quad x = 5$

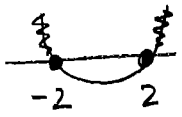


$x < \frac{1}{3}, \; x > 5$

d) $4x^2 - 16 \geq 0$

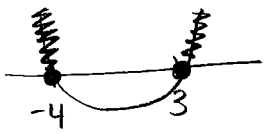
$(2x-4)(2x+4) \geq 0$

$x = 2 \quad x = -2$



$x \leq -2, \; x \geq 2$

3. Create an inequality that has the solution $x > 3$ and $x < -4$. Show solution in general form.

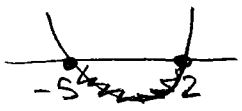


$(x+4)(x-3) > 0$

$x^2 - 3x + 4x - 12 > 0$

$x^2 + x - 12 > 0$

4. Create an inequality that has the solution $-5 \leq x \leq 2$. Show solution in general form.



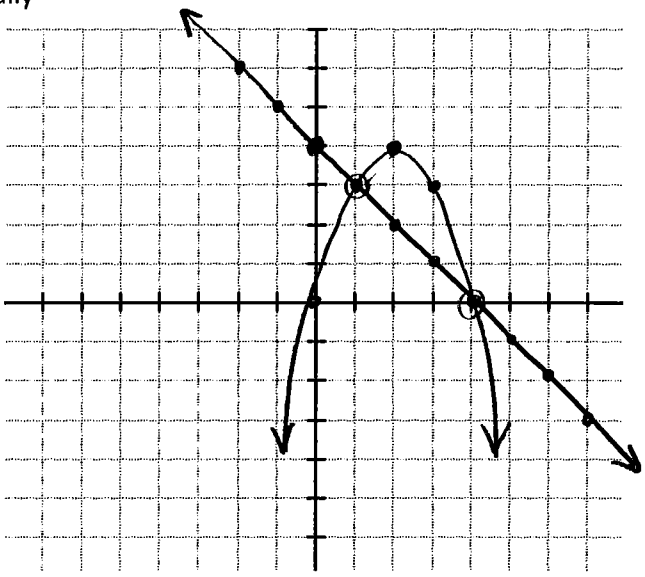
$(x+5)(x-2) \leq 0$

$x^2 - 2x + 5x - 10 \leq 0$

$x^2 + 3x - 10 \leq 0$

5. Solve the following systems graphically and algebraically

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



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

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

$-x+4 = -x^2+4x-4+4$
$+x^2 \quad -4x \qquad +x^2 \quad -4x$

$x^2 - 5x + 4 = 0$

$(x-4)(x-1) = 0$

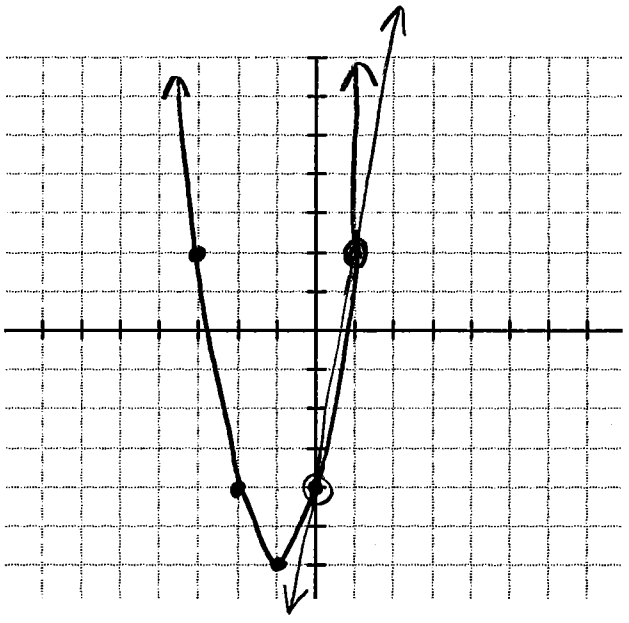
$x=4 \qquad x=1$

$y = -4+4 \qquad y = -1+4$

$y = 0 \qquad y = 3$

∴ Solutions: (4,0) and (1,3)

b) $y = 2(x+1)^2 - 6$
$y = 6x - 4$



$6x-4 = 2(x+1)^2-6$

$6x-4 = 2(x^2+2x+1)-6$

$6x-4 = 2x^2+4x+2-6$
$-6x \quad +4 \qquad -6x \quad +4$

$\frac{0}{2} = \frac{2x^2-2x}{2}$

$0 = x(x-1)$

$x=0 \qquad x=1$

$y = 6(0)-4 \qquad y = 6(1)-4$

$y = -4 \qquad y = 2$

∴ Solutions: (0,-4) and (1,2)

c) $y = x^2 - 4x - 1$

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

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

$+2x \quad -2 \quad +2x \quad -2$

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

$(x-3)(x+1) = 0$

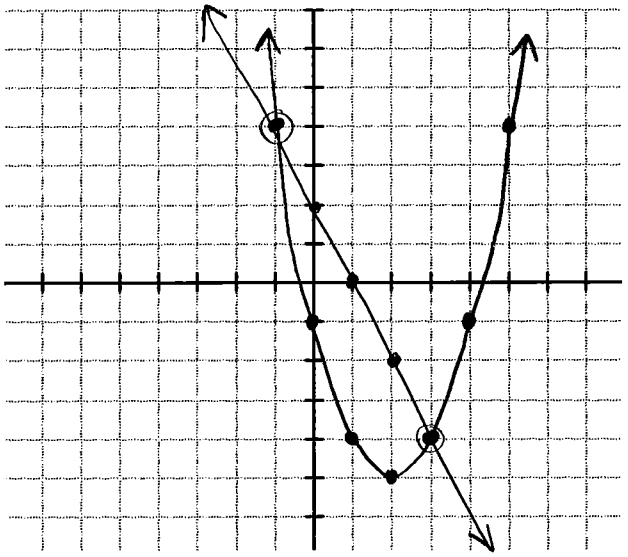
$\downarrow \qquad \downarrow$

$x = 3 \qquad x = -1$

$y = -2(3) + 2 \qquad y = -2(-1) + 2$

$y = -4 \qquad y = 4$

∴ Solutions: (3, -4) and (-1, 4)



Graph: $y = (x^2 - 4x + 4) - 4 - 1$ $\quad \frac{1}{2}(-4) = -2$, $(-2)^2 = 4$

$y = (x-2)^2 - 5$

d) $\frac{2y}{2} - \frac{6x}{+6x} = \frac{-6}{2} + \frac{6x}{2} \rightarrow y = 3x - 3$

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

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

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

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

$+3x^2 - 12x + 9 \qquad +3x^2 \quad -12x \quad +9$

$\frac{3x^2}{3} - \frac{9x}{3} + \frac{6}{3} = \frac{0}{3}$

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

$(x-2)(x-1) = 0$

$\downarrow \qquad \downarrow$

$x = 2 \qquad x = 1$

$y = 3(2) - 3 \qquad y = 3(1) - 3$

$y = 3 \qquad y = 0$

∴ Solutions: (2, 3) and (1, 0)