Chapter 5 Review Name KEY

1. Determine which of the ordered pairs are solutions to the given inequality.

a) $3x - 2y > 12$ $\{(6,3), (12,-4), (-6,-1)\}$ (solution)

$3(6) - 2(3) > 12$
$18 - 6 > 12$
$12 > 12$ false

$3(12) - 2(-4) > 12$
$36 + 8 > 12$
$44 > 12$ true

$3(-6) - 2(-1) > 12$
$-18 + 2 > 12$
$-16 > 12$ false

b) $y \geq 2x^2 - 10$ $\{(4,25), (-3,12), (-2,-2)\}$

$25 \geq 2(4)^2 - 10$
$25 \geq 22$
true

$12 \geq 2(-3)^2 - 10$
$12 \geq 8$
true

$-2 \geq 2(-2)^2 - 10$
$-2 \geq -2$
true

2. Graph the following inequalities.

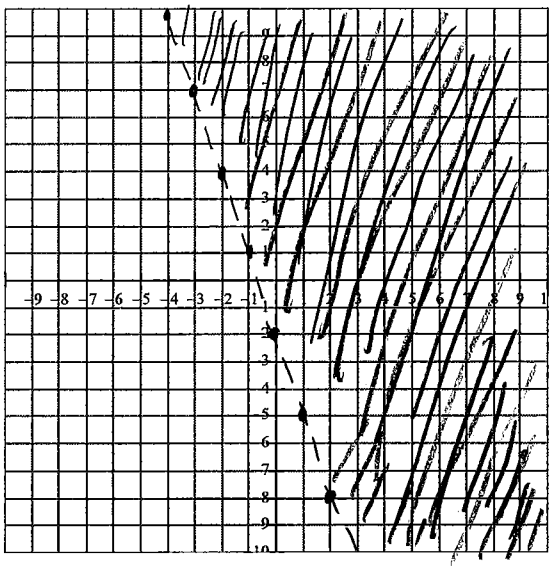
a) $3x + y > -2$ (dashed)

$y > -3x - 2$

slope $= \frac{-3}{1}$

y-int $= -2$

test (0,0):
$3(0) + 0 > -2$
$0 > -2$ ✓ true



b) $4x - 3y + 6 \leq 0$ (solid)

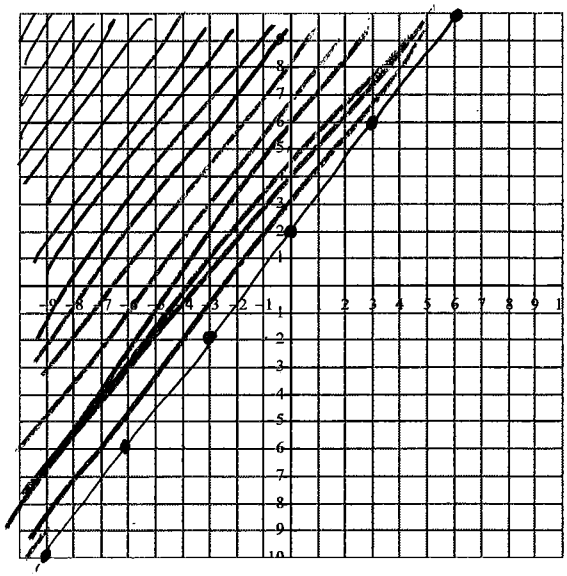
$\frac{-3y}{-3} \leq \frac{-4x}{-3} \frac{-6}{-3}$

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

slope $= \frac{4}{3}$

y-int $= 2$

test (0,0):
$0 - 0 + 6 \leq 0$
$6 \leq 0$ x
false



c) $y \geq x^2 - 2x - 3$ → solid

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

$(-1)^2 = 1$

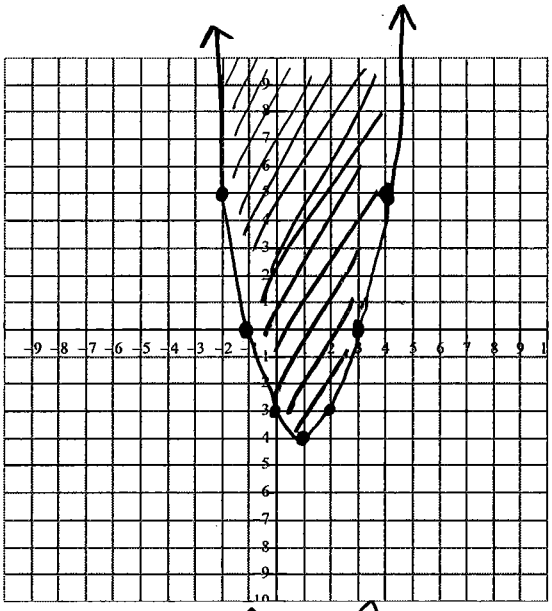
$y \geq (x^2 - 2x + 1) - 1 - 3$

$y \geq (x-1)^2 - 4$

test (0,0):

$0 \geq 0 - 0 - 3$

$0 \geq -3$ true



d) $y < 3x^2 - 6x + 5$ → dashed

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

$(-1)^2 = 1$

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

$y < 3(x^2 - 2x + 1 - 1) + 5$

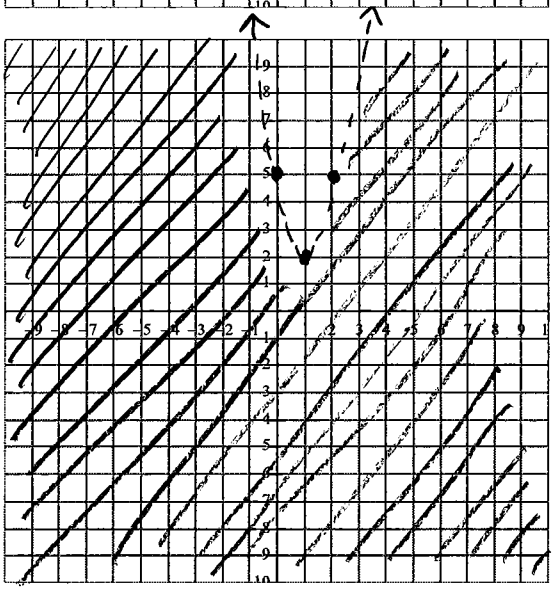
$y < 3(x-1)^2 + 2$

test (0,0):

$0 < 0 - 0 + 5$

$0 < 5$

true

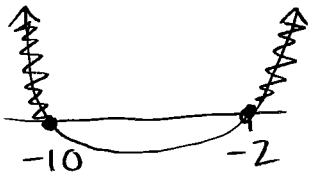


3. Solve the following quadratic inequalities. (Draw a rough sketch—it will help)

a) $x^2 + 12x + 20 \geq 0$

$(x+10)(x+2) \geq 0$

$x = -10$ $x = -2$



$-10 \geq x$ & $-2 \leq x$

b) $3x^2 + 7x < -2$

$+2 \quad +2$

$3(2)=6$ → $6, 1$

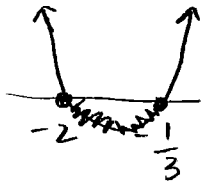
$3x^2+7x+2<0$

$3x^2+6x+x+2<0$

$3x(x+2)+(x+2)<0$

$(3x+1)(x+2)<0$

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



$-2<x<-\frac{1}{3}$

c) $2x^2 > 9x - 9$

$2(9)=18$ → $-6, -3$

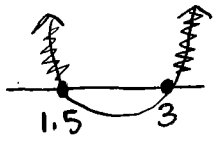
$2x^2-9x+9>0$

$2x^2-6x-3x+9>0$

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

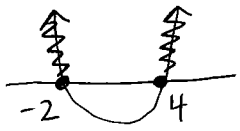
$(2x-3)(x-3)>0$

$x=\frac{3}{2} \qquad x=3$



$x<1.5$ & $x>3$

4. Create an inequality that has the solution $x > 4$ and $x < -2$. Show solution in general form.



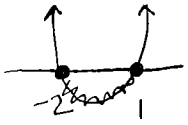
$x=4 \qquad x=-2$

$(x-4)(x+2)>0$

$x^2+2x-4x-8>0$

$x^2-2x-8>0$

5. Create an inequality that has the solution $-2 \leq x \leq 1$. Show solution in general form.



$x=-2 \qquad x=1$

$(x+2)(x-1)\leq 0$

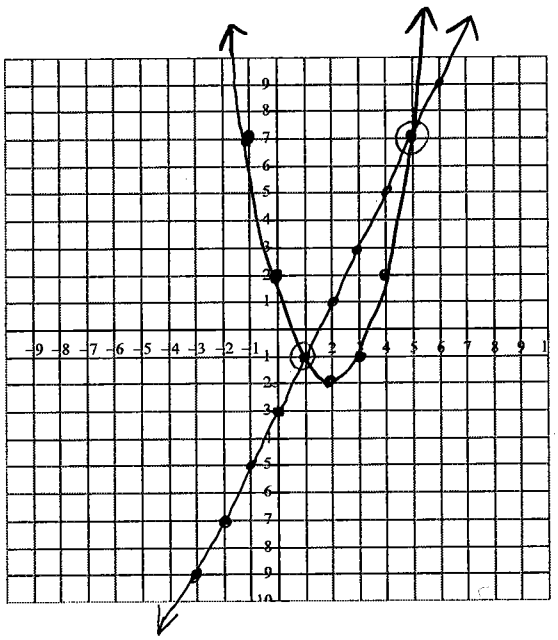
$x^2-x+2x-2\leq 0$

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

6. Solve the following systems graphically and algebraically

a) $y = (x-2)^2 - 2$ → 2 ↓ 2

$y = 2x - 3$



① Set equations equal to eachother

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

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

$-2x + 3 \qquad -2x + 3$

$x^2 - 6x + 5 = 0$

$(x-5)(x-1) = 0$

↓ ↓

$x = 5 \qquad x = 1$

② Sub answers into equation to find y:

$y = 2(5) - 3 \qquad y = 2(1) - 3$

$y = 7 \qquad y = -1$

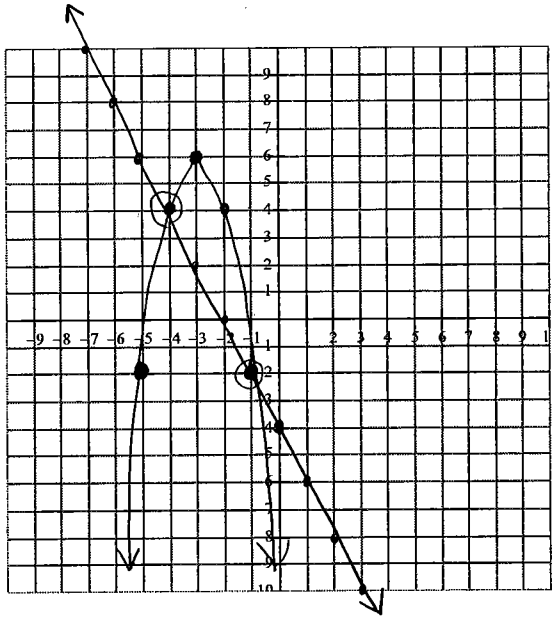
∴ (5, 7) and (1, -1) are solutions

b) $y = -2(x+3)^2 + 6$ ← 3 ↑ 6

$y = -2x - 4$

Steps: 1, 3, 5

x-2: -2, -6, -10



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

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

$-2x - 4 = -2x^2 - 12x - 18 + 6$

$\frac{2x^2 + 10x + 8}{2} = \frac{0}{2}$

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

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

↓ ↓

$x = -4 \qquad x = -1$

↓ ↓

$y = -2(-4) - 4 \qquad y = -2(-1) - 4$

$y = 4 \qquad y = -2$

∴ (-4, 4) and (-1, -2) are solutions

c) $y = x^2 - 4x - 1$ ①

$y = 2x - 6$ ②

*change into vertex form to graph!

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

$(-2)^2 = 4$

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

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

$y = (x-2)^2 - 5$ $\rightarrow 2 \downarrow 5$

$2x - 6 = x^2 - 4x - 1$

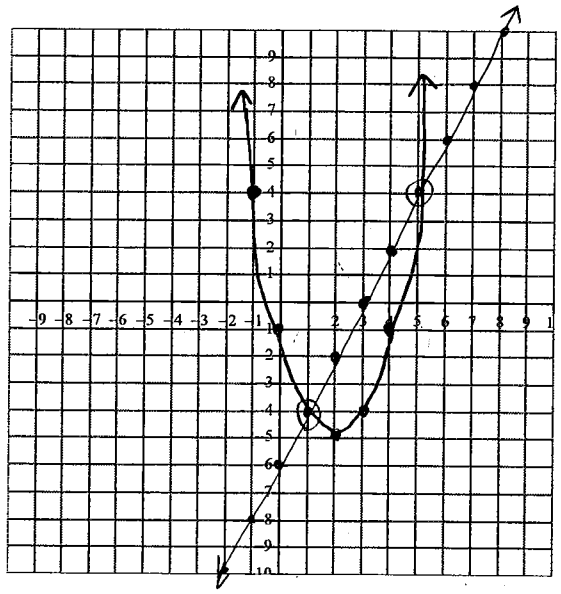
$0 = x^2 - 6x + 5$

$0 = (x-5)(x-1)$

$x = 5$ $\quad$ $x = 1$

$y = 2(5) - 6$ $\quad$ $y = 2(1) - 6$

$y = 4$ $\quad$ $y = -4$



∴ Solutions are (5,4) and (1,−4)

d) $2y - 6x = -18$

$y = -3(x-4)^2 + 9$ $\rightarrow 4 \uparrow 9$

Steps: 1, 3, 5

x-3: −3, −9, −15

$2y - 6x = -18$

$\frac{2y}{2} = \frac{6x}{2} - \frac{18}{2}$

$y = 3x - 9$

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

$3x - 9 = -3(x^2 - 8x + 16) + 9$

$\frac{0}{-3} = \frac{-3x^2 + 21x - 30}{-3}$

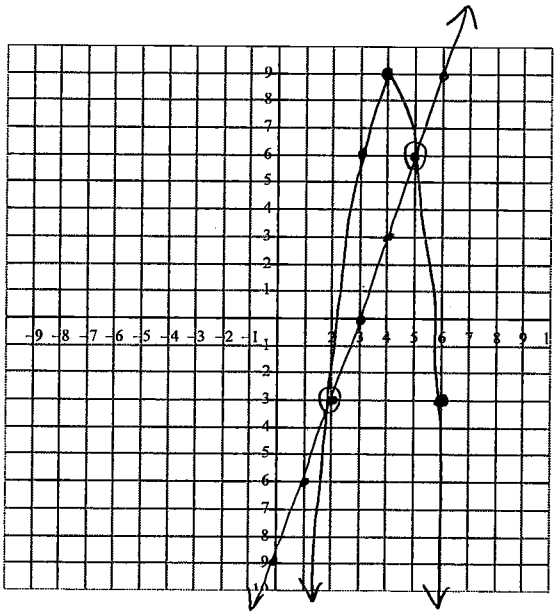
$0 = x^2 - 7x + 10$

$0 = (x-5)(x-2)$

$x = 5$ $\quad$ $x = 2$

$y = 3(5) - 9$ $\quad$ $y = 3(2) - 9$

$y = 6$ $\quad$ $y = -3$



∴ solutions are (5,6) and (2,−3)

7. Two numbers are related below:
   ① When twice the second number is subtracted from the first number, the result is -11
   ② The square of the sum of the first number and 2 is equal four less than the second number

   a) Create a system of equations to represent this inequality (2 marks)

Let x be the first number and y be the second number

① $x - 2y = -11$

② $(x+2)^2 = y - 4$

   b) Solve the system to determine the numbers (2 marks)

① $\frac{x}{2} + \frac{11}{2} = \frac{2y}{2}$

$\frac{1}{2}x + \frac{11}{2} = y$

② $(x+2)^2 + 4 = y$

$\frac{1}{2}x + \frac{11}{2} = (x+2)^2 + 4$

$2 \times \left(\frac{1}{2}x + \frac{11}{2}\right) = \left((x^2+4x+4)+4\right) \times 2$

$x + 11 = 2x^2 + 8x + 8 + 8$

$2(5) = 10$

$5 \quad 2$

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

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

$0 = x(2x+5) + (2x+5)$

$0 = (x+1)(2x+5)$

$x = -1 \rightarrow y = 5$

$x = \frac{-5}{2} \rightarrow y = \frac{17}{4}$

∴ solutions are: $(-1, 5)$ and $\left(\frac{-5}{2}, \frac{17}{4}\right)$

8. A stuntman jumped from an elevation of 500 m and was in free fall before he opened his parachute. His elevation, h metres, t seconds after jumping is modeled by these equations:
   $h = -4.9t^2 + 2t + 500$, before the parachute was opened
   $h = -5t + 188$, after the parachute was opened

   a) How many seconds after the stuntman jumped did he open the parachute?

$-4.9t^2 + 2t + 500 = -5t + 188$

$-4.9t^2 + 7t + 312 = 0$

solve for "t"

$a = -4.9 \quad b = 7 \quad c = 312$

$t = \frac{-7 \pm \sqrt{(7)^2 - 4(-4.9)(312)}}{2(-4.9)}$

$t = \frac{-7 \pm \sqrt{6164.2}}{-9.8}$

$t = -7.297$ ← time can't be negative

$t = \boxed{8.726}$

∴ the stuntman opened the parachute after 8.7 seconds

   b) What was his elevation when he opened the parachute?

$t = 8.726$

*sub into either equation

$h = -5(8.726) + 188$

$h = \boxed{144.37}$

∴ his elevation is 144.37m when he opens the parachute