Math 2
Unit 3 – Rational Exponents and Solving Quadratics
Lesson 6 → Linear vs. Quadratic Systems

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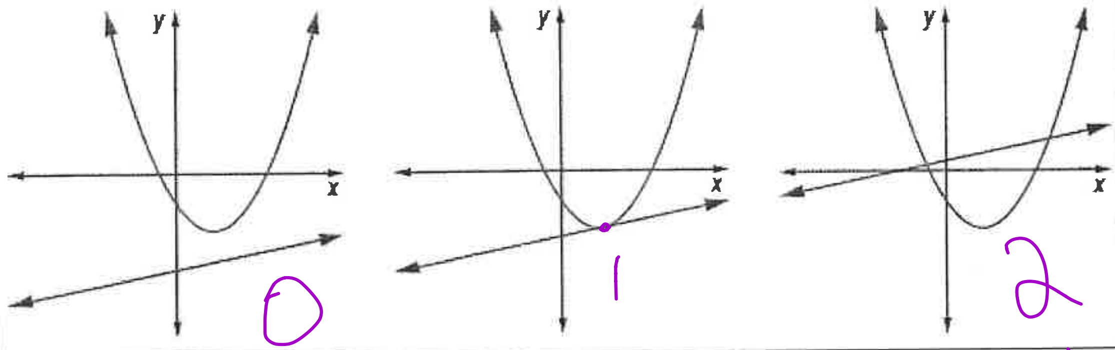
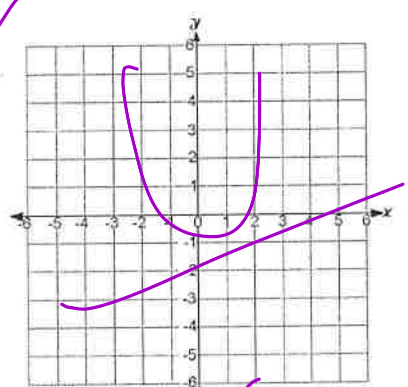
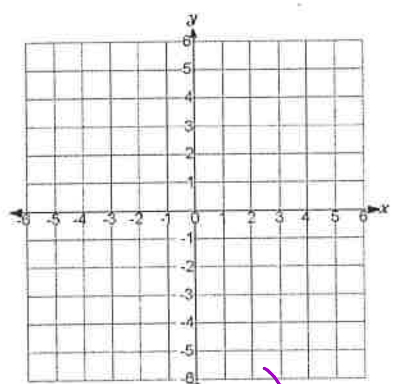
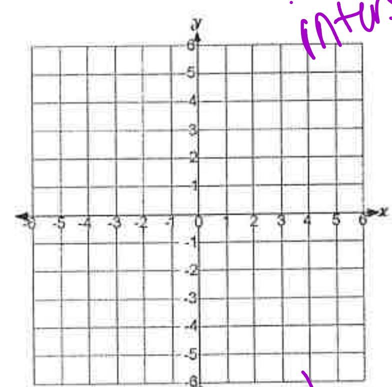
Date____________________ Pd______

➢ When a linear function and a quadratic function are graphed on the same coordinate plane, the graphs below represent the possible number of solutions for the system of equations.

0, 1, or 2 solutions can be found.



➢ Solve each system of equations **graphically**:

$y = x^2 - x + 3$ $y = 2x - 1$	$y = x^2 - 3x + 2$ $y = x - 2$	$y = 10x^2 - 28x - 39$ $y = 2x + 1$
		
$(x, y) =$ ∅	$(x, y) =$ $(2,0)$	$(x, y) =$ $(-1,-1)$ $(4,9)$

type into Desmos
Look for intersection

➢ Solve each system of equations **algebraically**:

$y = x^2 - x + 3$ $y = 2x - 1$	$y = x^2 - 3x + 2$ $y = x - 2$	$y = 10x^2 - 28x - 39$ $y = 2x + 1$
$2x-1 = x^2 - x + 3$ $-2x+1 \quad -2x+1$ $0 = x^2 - 3x + 4$ $0 = (x-1)(x-4)$		
$(x, y) =$ ∅	$(x, y) =$ ______	$(x, y) =$ ______

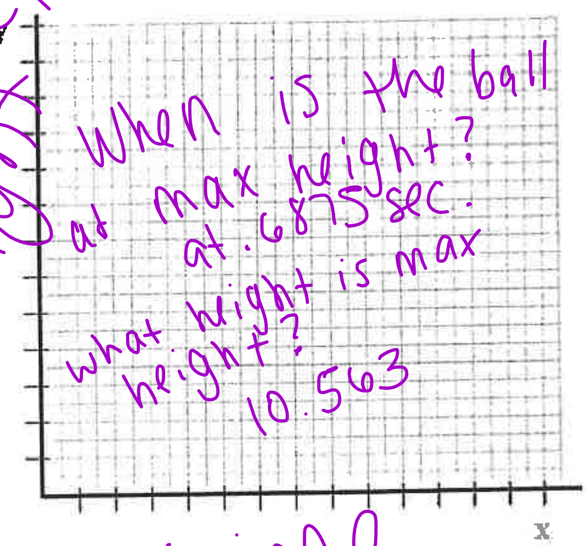
$\frac{3 \pm \sqrt{9-4(1)(4)}}{} = \frac{3 \pm \sqrt{-7}}{}$

2(1) 2

➢ Applications of Linear/Quadratic Systems:

Example #1: A ball thrown is modeled by the function: $y = -16x^2 + 22x + 3$.
Using what you know about quadratic functions, answer the following questions.

1) Sketch the graph :



feet

height

When is the ball at max height?
at .6875 sec.

what height is max height?
10.563

time
seconds

2) Given the context of the problem, what is an appropriate domain and range for the graph?

D: [0, 1.5] R: [0, 10.563]

3) Write an equation to show when the ball will be **exactly** 10 feet in the air and then solve.

$y = -16x^2 + 22x + 3$

$y = 10$

(.5, 10) (.875, 10)

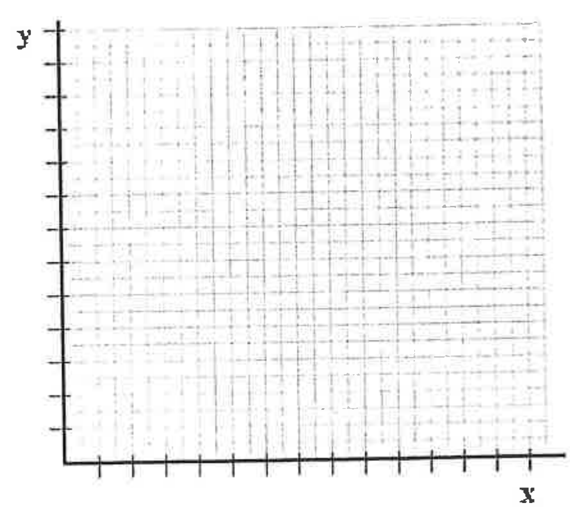
4) Write an inequality to show when the ball will be at a height **less than** 10 feet in the air and then solve.

5) Write an inequality to show when the ball will be at a height **higher than** 10 feet in the air and then solve.

Example #2: The student council decides to put on a concert to raise money for an after school program. They have determined that the price of the ticket will affect their profit. The functions shown below represent their potential income and cost of putting on the concert, where t represents ticket price.

Income: $I(t) = -30t^2 + 330t$ **Cost:** $C(t) = -30t + 330$

1) Sketch the graph of each function:



2) Find algebraically and graphically the **break-even** point. (Hint: $Income = Cost$)

3) Write an inequality to show where the cost is greater than the income and then solve.

4) Write an inequality to show where the income is greater than the cost and then solve.

5) Which ticket price would you use in order to maximize your profit? Where is this shown on the graph?

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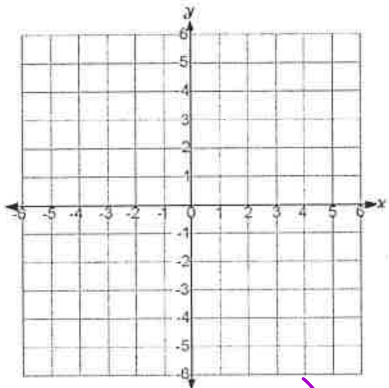
Lesson 6 → Linear vs. Quadratic Systems HOMEWORK

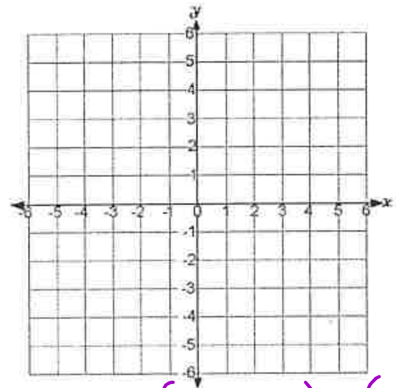
Solve each of these equations, sketch graphs showing the functions involved, and label points corresponding to solutions with their coordinates.

1. $y = x + 2$
   $y = x^2 + 3x - 6$



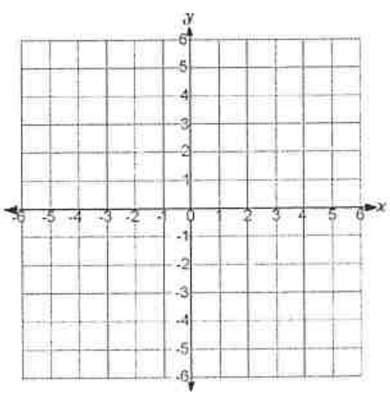
$(x, y) =$ (-4,-2) (2,4)

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



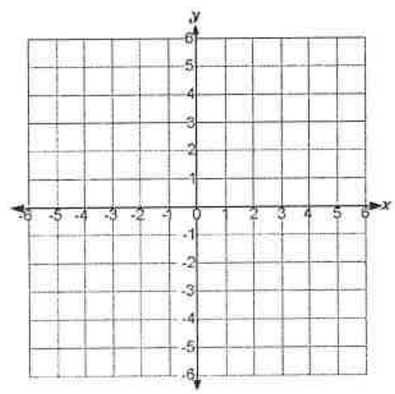
$(x, y) =$ (-4,6) (2,0)

3. $y = 2x + 3$
   $y = 4 + x^2$



$(x, y) =$ ______________

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



$(x, y) =$ ______________

Solve each system algebraically:

5. $y = x^2 - 6x + 10$
   $y = -x + 4$

$(x, y) =$ (2,2)(3,1)

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

$(x, y) =$ (-2,4)(1,1)

Math 2
Unit 3 – Rational Exponents and Solving Quadratics
Lesson 7 → Quadratic Inequalities

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Review:

➢ **Steps to Graph an Inequality:**

✓ Graph the boundary line → If the symbol is $<$ or $>$ use a dotted line
→ If the symbol is $\leq$ or $\geq$ use a solid line

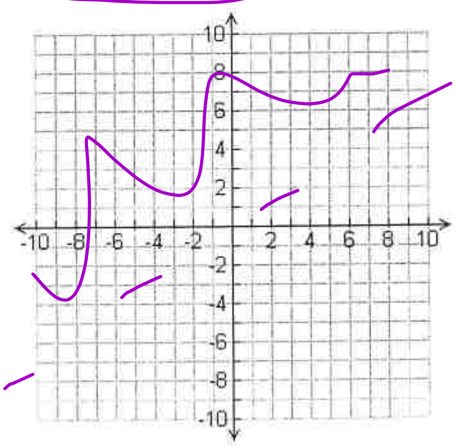
✓ Determine the shading → If the symbol is $>$ or $\geq$ then shade above the line or curve
→ If the symbol is $<$ or $\leq$ then shade below the line or curve

✓ You can check your shading by picking a point on the graph and plugging it into the inequality. If it is a solution then shade that way. If it is not a solution, then shade the other way.

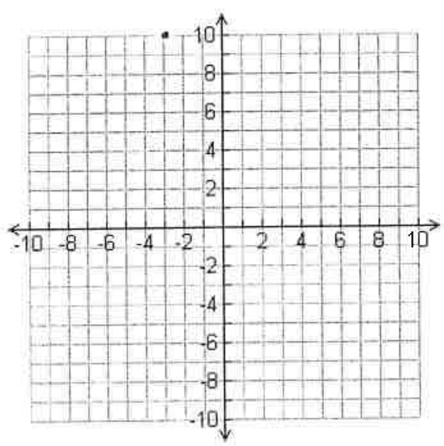
Desmos

➢ EXAMPLES: Graph each linear or quadratic inequality

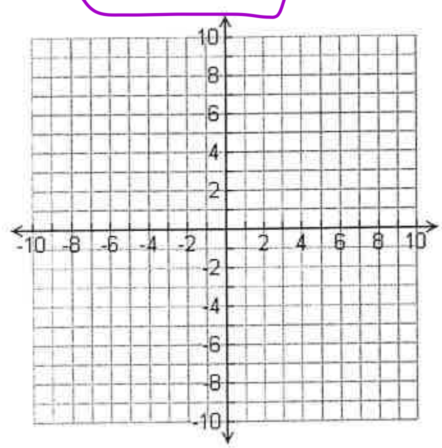
1) $y > x - 2$



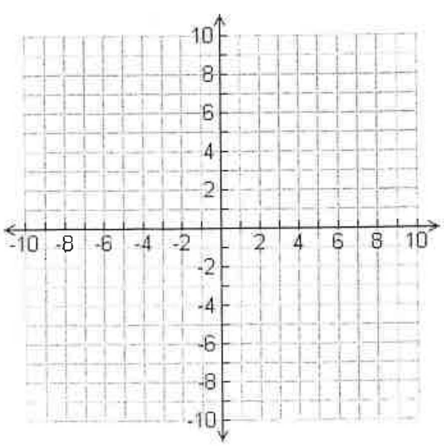
2) $y \leq -2x + 1$



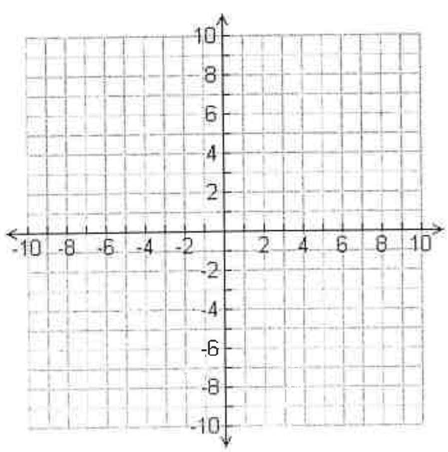
3) $y \geq \frac{-2}{3}x - 1$



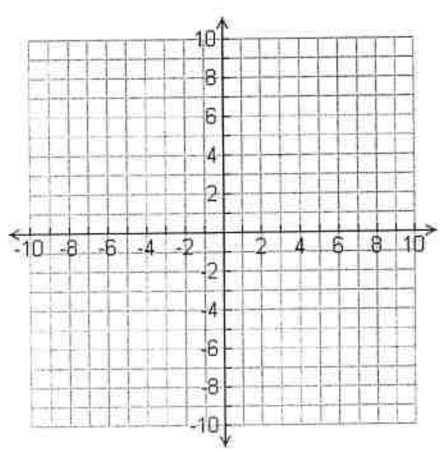
4) $y > x^2 + 4x + 4$



5) $y \geq -x^2 - 2x - 3$



6) $y < x^2 - 7x + 10$

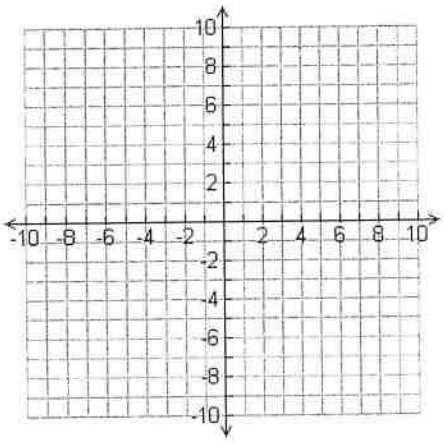


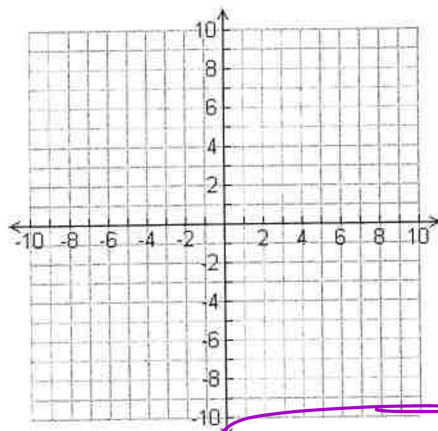
➢ Graph each **system** of inequalities. Be sure to shade the solution.

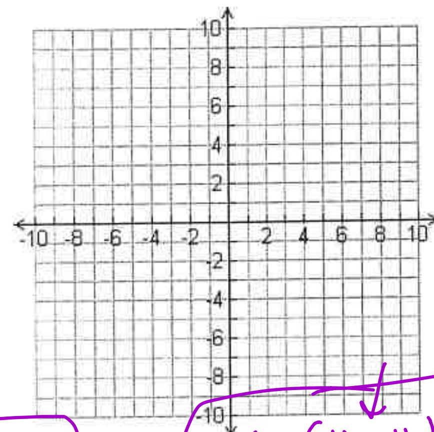
7) $y \geq x^2 + 4x + 3$
$y \leq 2x + 6$

8) $y < -x^2 + 2x + 4$
$y > -x + 4$

9) $y \geq x^2 - 6x + 8$
$y \geq -x(x-4)$







$(-\infty, \#) \cup (\#, \infty)$ $>$
$(-\infty, \#] \cup [\#, \infty)$ $\geq$

$<$ $(\#, \#)$
$\leq$ $[\#, \#]$

➢ How can we use graphing to solve an inequality in one-variable?

- Solve each of the inequalities. Write your solution as an inequality and graph on a number line.

$x^2 - x - 6 \leq 0$ $x^2 - x - 6 = 0$ $(x-3)(x+2) \leq 0$ $x = 3 \quad x = -2$ $\boxed{[-2, 3]}$	$x^2 - x - 6 \geq 0$ $(x-3)(x+2)$ $x = 3 \quad x = -2$ $(-\infty, -2] \cup [3, \infty)$	$x^2 + 2x > 0$ $x(x+2)$ $x = 0 \quad x = -2$ $(-\infty, -2) \cup (0, \infty)$
$x^2 + 2x - 24 \leq 0$ $(x+6)(x-4)$ $x = -6 \quad x = 4$ $\boxed{[-6, 4]}$	$3x^2 - 5x > 8$ $3x^2 - 5x - 8 > 0$ $x^2 - 5x - 24 > 0$ $(x - \frac{8}{3})(x + \frac{3}{3})$ $(3x-8)(x+1)$ $x = 8/3 \quad x = -1$ $\boxed{(-\infty, -1) \cup (8/3, \infty)}$	$x^2 + 2x > 2x + 36$ $-2x \quad -2x \quad -36$ -36 $x^2 - 36 > 0$ $(x-6)(x+6) > 0$ $x = 6 \quad x = -6$ $\boxed{(-\infty, -6) \cup (6, \infty)}$

Math 2
Unit 3 – Rational Exponents and Solving Quadratics
Lesson 7 → Quadratic Inequalities HOMEWORK

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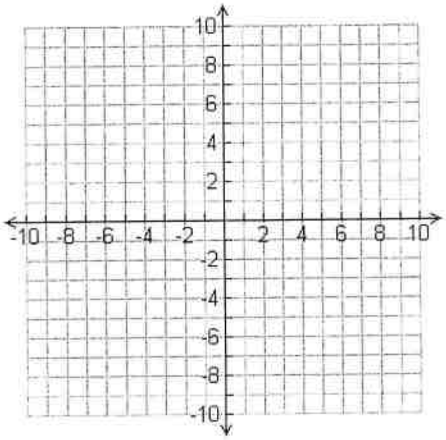
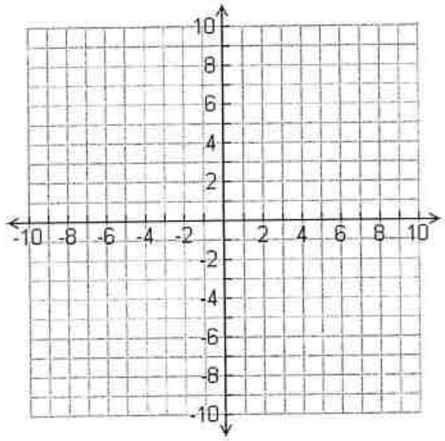
➢ Graph each quadratic inequality. Be sure to shade the solution.

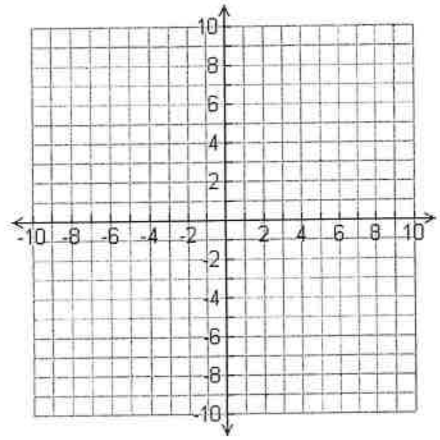
1) $y \geq x^2 - 1$



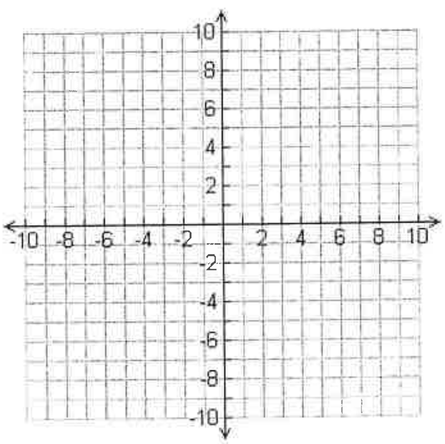
2) $y < x^2 - 4x - 4$



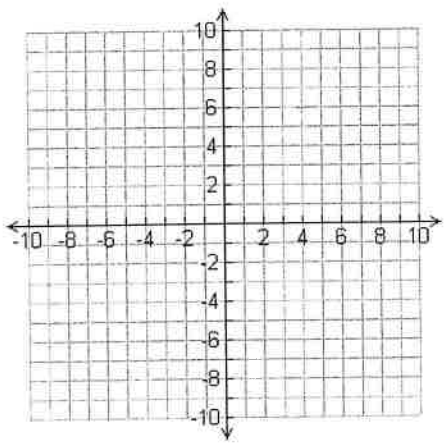
3) $y \leq -x^2 + 2x - 3$



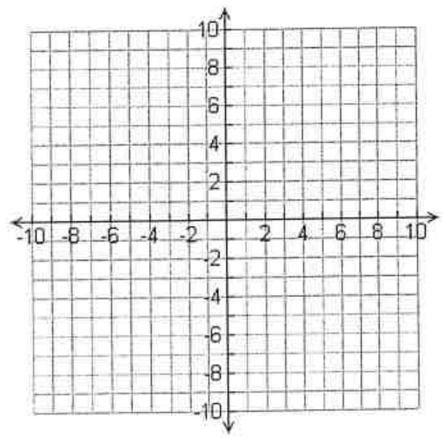
4) $y > -x^2 + 4x + 5$



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

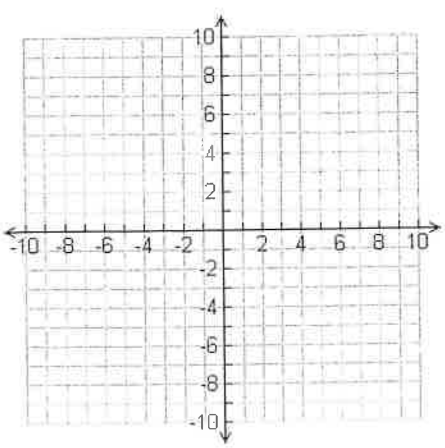


6) $y \leq x^2 + 6x + 8$



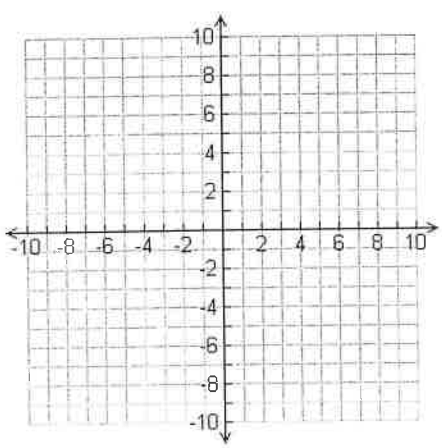
7) $y \geq x^2 - 3$

$y \leq 2x$



8) $y > x^2 - 5x + 4$

$y > -x + 1$



9) $y \leq -x^2 + 4x$

$y \geq 3x + 2$