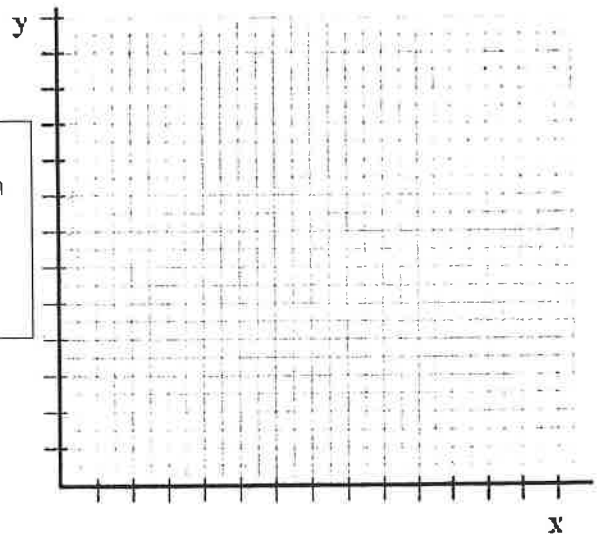➢ Application of Quadratic and Linear Inequalities

7. Each year the 'Rock the Vote' committee organizes a public rally. Based on previous years, the organizers decided that the income from ticket sales, $I(t)$, is related to ticket price (t) by the equation $I(t) = -40t^2 + 400t$. Cost, $C(t)$, of operating the public event is also related to ticket price (t) by the equation $C(t) = -40t + 400$.

y

x

A) What ticket price would generate the maximum income? Where is this shown on the graph?

$5   vertex/max

B) For what ticket price would the operating cost be equal to the income from ticket sales?

$1 , $10

C) Write and solve an inequality to show where the operating cost is greater than the income from ticket sales.

$[0,1) \cup (10, \infty)$

D) Write and solve an inequality to show where the income from ticket sales is greater than the operating cost.
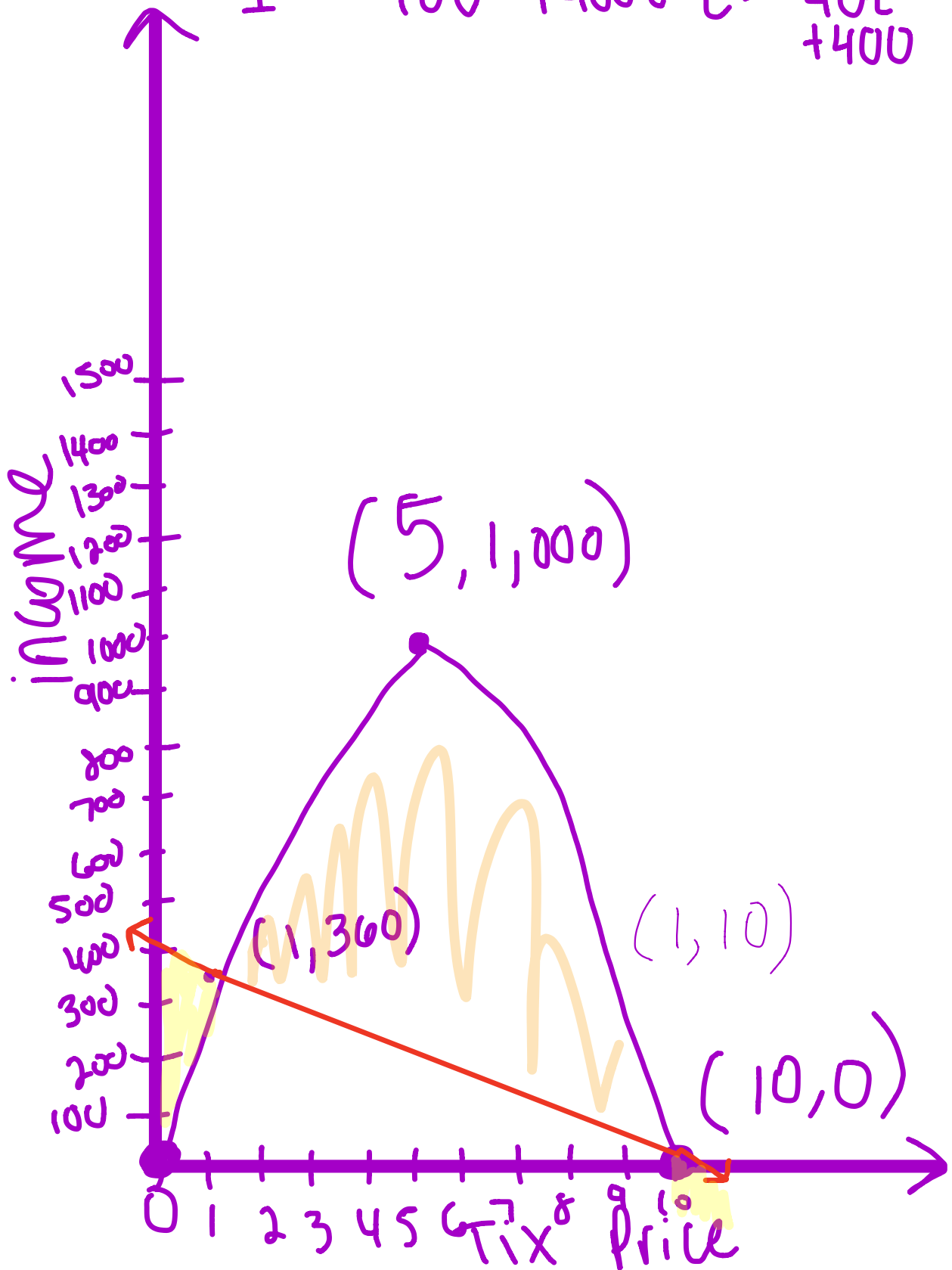
$(1, 10)$

Round to 2 dec.m.

e) $I(3.75)$ when x = 3.75
2nd, calc, value

= $937.50

f) $I(t) = 756$ when decreasing (y, type in new amount, then 2nd calc, int)

$17.47 per ticket

$$I = -40t^2 + 400t \quad C = -40t + 400$$

income

Tix Price

$(5, 1,000)$

$(1, 360)$

$(1, 10)$

$(10, 0)$

0 1 2 3 4 5 6 7 8 9 10

$[0,1) \cup (10, \infty)$

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.

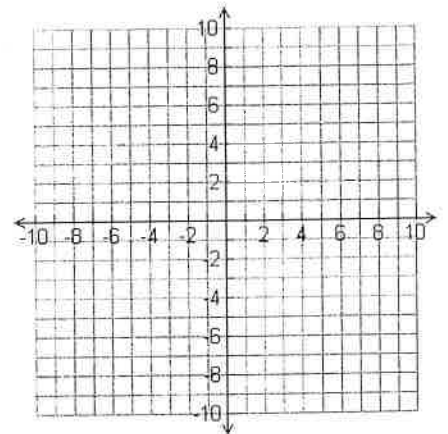➢ **EXAMPLES:** Graph each linear or quadratic inequality
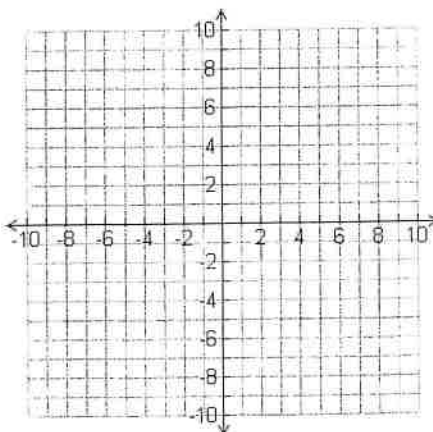
1) $y > x - 2$
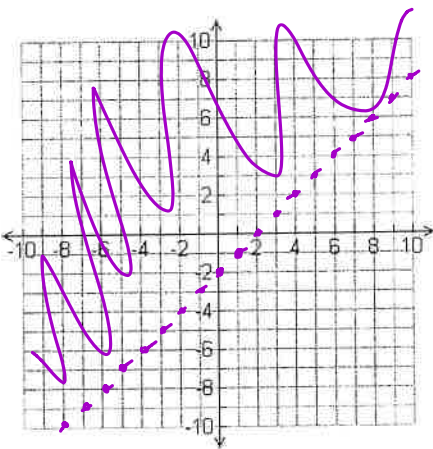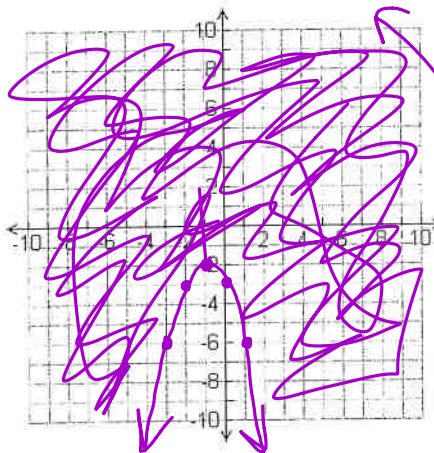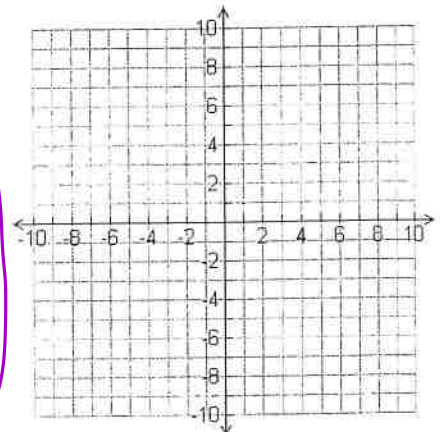
2) $y \leq -2x + 1$
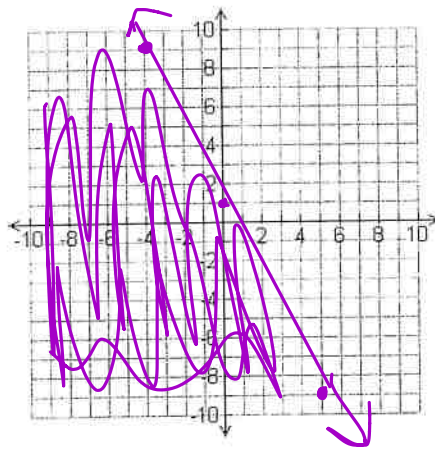
3) $y \geq \frac{-2}{3}x - 1$

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

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

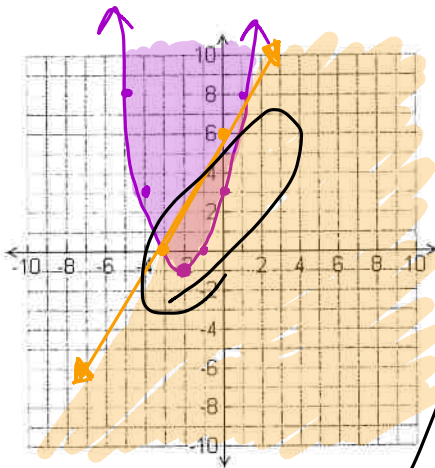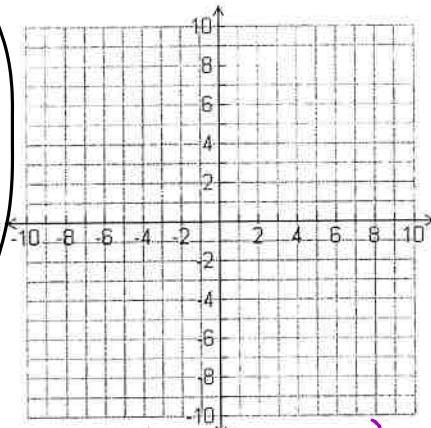6) $y < x^2 - 7x + 10$

➤ Graph each **system** of inequalities. Be sure to shade the solution.
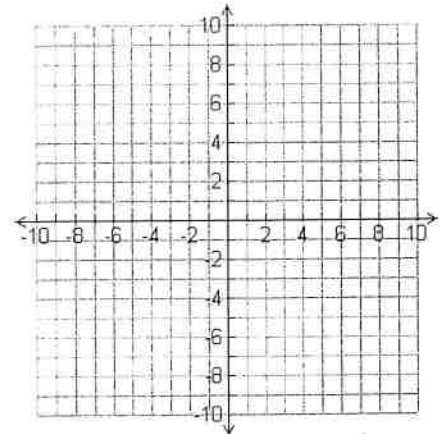
7) $y \geq x^2 + 4x + 3$
   $y \leq 2x + 6$

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

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

$> (-\infty, \#_1) \cup (\#_2, \infty)$
$\geq (-\infty, \#_1] \cup [\#_2, \infty)$

$< \quad (between)$
$\leq \quad [between]$

➤ 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~~.

$x^2 - x - 6 \leq 0$	$x^2 - x - 6 \geq 0$	$x^2 + 2x > 0$
$(x-3)(x+2) \leq 0$ $x=3 \quad x=-2$ $[-2, 3]$	$x=3 \quad x=-2$ $(-\infty, -2] \cup [3, \infty)$ ✓ $\times \quad 44$	$x(x+2) > 0$ $x=0 \quad x=-2$ $(-\infty, -2) \cup (0, \infty)$ ✓
$x^2 + 2x - 24 \leq 0$ $A=1 \ B=2 \ C=-24$ $\dfrac{-2 \pm \sqrt{4 - 4(1)(-24)}}{2}$ $\dfrac{-2 \pm \sqrt{100}}{2} = \dfrac{-2 \pm 10}{2}$ $\dfrac{-2+10}{2} = 4 \qquad \dfrac{-2-10}{2} = -6$ $[-6, 4]$	$3x^2 - 5x > 8$ $3x^2 - 5x - 8 = 0$ $x^2 - 5x - 24 = 0$ $(x-8)(x+3)$ $\dfrac{}{3} \quad 3$ $(3x-8)(x+1)$ $x=8/3 \quad x=-1$ $(-\infty, -1) \cup (8/3, \infty)$ $\quad 12$	$x^2 + 2x > 2x + 36$ $-2x-36 \quad -2x \quad -36$ $x^2 - 36 > 0$ $(x-6)(x+6) > 0$ $x=6 \quad x=-6$ $(-\infty, -6) \cup (6, \infty)$

Math 2 – Honors
Unit 3 – Quadratic Functions Continued
Lesson 6 → Quadratic Inequalities HOMEWORK

Name_____
Date_____ Pd_____

Handwritten notes (purple): Quiz: Memorize Quad Formula / Solving Quads └ How many sol. / what type └ real/imag, irr/rat / Discriminant / graphical inequalities / Application / Systems Equalities / ex $y = x^2 - 5x + 7$ / $y = 2x + 1$

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

1) $y \geq x^2 - 1$
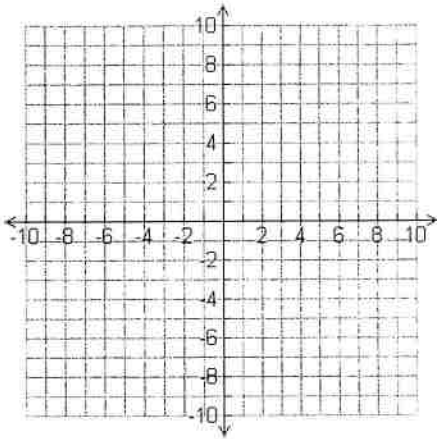
2) $y < x^2 - 4x - 4$
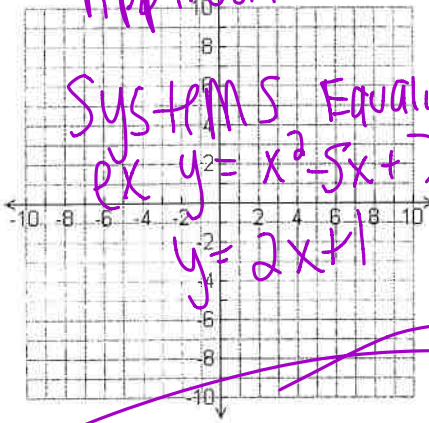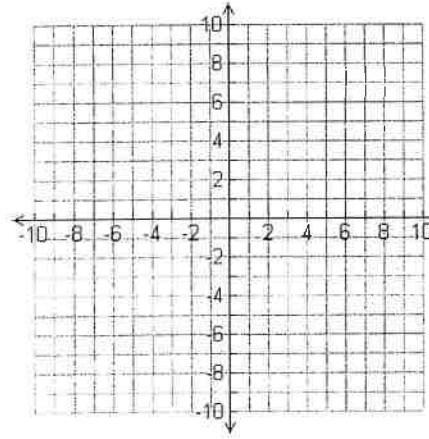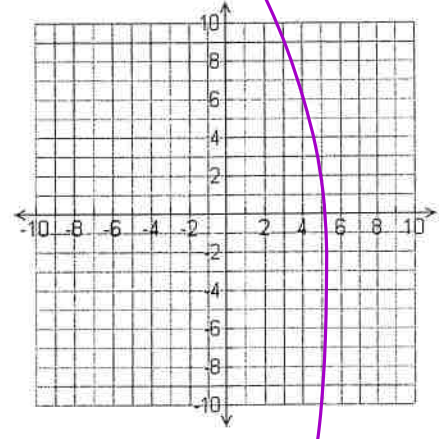
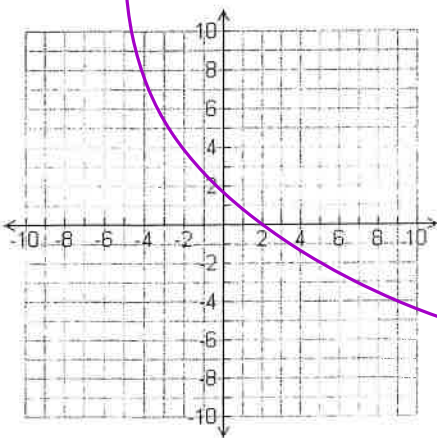3) $y \leq -x^2 + 2x - 3$
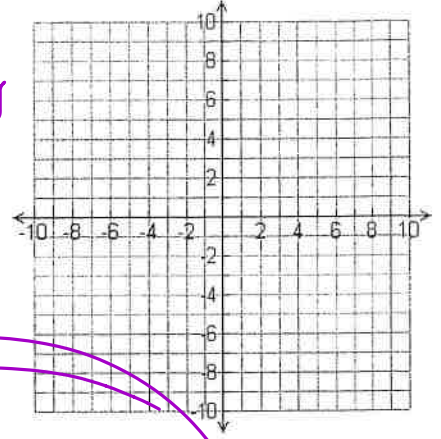
4) $y > -x^2 + 4x + 5$
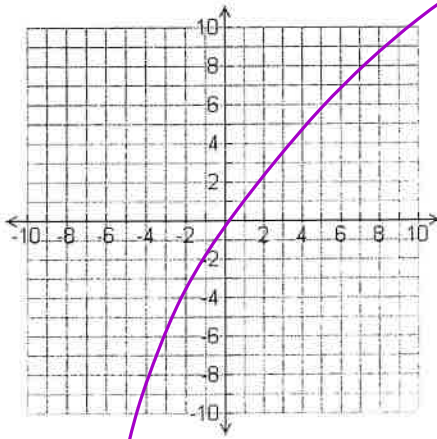
5) $y \leq 4x^2 - 1$

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

$y \geq 3x + 2$

10) $y \geq x^2 - 4$
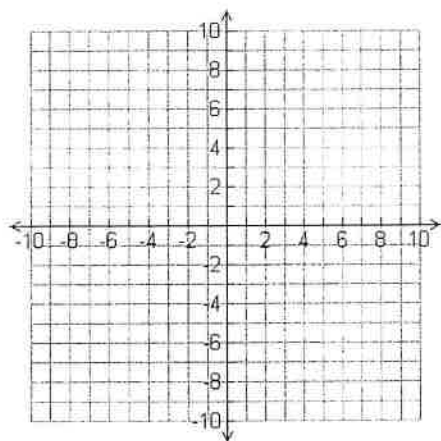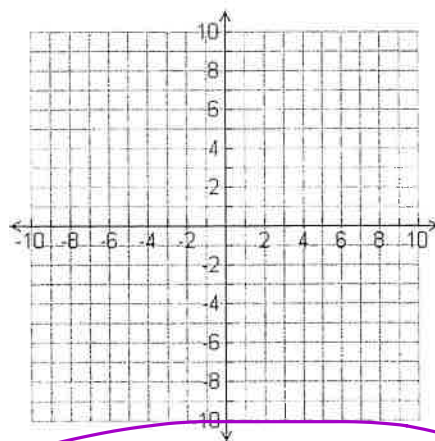 $y \leq -x^2 - x + 2$

11) $y > x^2 + 2x + 1$
   $y > x^2 - 4x + 4$

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

12. $(x+3)(x-4) \leq 0$	13. $x^2 - 9x + 14 \geq 0$	14. $x^2 - 7x > 0$
15. $5x^2 - 180 \leq 0$	16. $x^2 - 12x + 32 > -3$	17. $x^2 + 14x \leq -49$