Name_____

Date_____

Advanced Algebra

Unit 6: Advanced Systems

Assignment #1

For the following problems, make a graph of the parabola and the line give the appropriate x intervals to make the inequality true:

You should quickly use the formula $x=\frac{-b}{2a}$ to get the x coordinate of the vertex and then do VARS to get the y coordinate. Then graph the parabola.

1) $-x^2 - 4x - 1 < 3x+11$ Vertex (-2,3)

2) $x^2 - 4x + 2 > 2x-7$ Vertex (2,-2)

3) $-x^2 - 6x - 9 > 2x - 6$ Vertex (-3,0)

4) $-x^2 + 6x - 4 > 1x+0$ Vertex (3,5)

5) $x^2 - 12x + 32 > -\frac{1}{2}x+\frac{1}{2}$ Vertex (6,-4)

6) $-x^2+6 > \frac{-1}{2}x + 2$ Vertex (0,6)

7) $-x^2-8x-13 > x+5$ Vertex (-4,3)

8) $x^2-8x+16 < -x+6$ Vertex (4,0)

9) $x^2-4x+2 > 2x-7$ Vertex (2,-2)

Steps

① Sketch the parabola

② Sketch the line

③ Find the Intersection

* you do this by setting both functions equal to each other and using the quadratic formula

④ Interpret your Answer

Solve the following absolute Value Inequalities:

1) $4|2x - 4| \leq 28$

2) $|4x - 16| \geq 32$

3) $\frac{3}{4}|x + 12| \geq 123$

4) $\left|\frac{1}{4}x - 18\right| \leq 215$

5) $|4x - 16| \geq 552$

6) $|x - 18| \geq 45$

Here are additional notes on how to find where the parabola is greater than the line

Advanced Algebra

Unit 6: Advanced Systems

Assignt #1

Working with Advanced Systems:

I can find where the line and the parabola intersect.

Learning Target: To graph a parabola and line using our previous graphing skills to find the domain (x values) that make the given Inequality true.

1) $-x^2-4x-1<3x+11$

This problem can be accomplished in 2 steps along with a fairly accurate graph.

Step #1	I will find the vertex of the given parabola by using the vertex formula of $x=\frac{-b}{2a}$
Step #2:	I will find where the parabola and the line intersect. To do this, as with ANY intersection, we will set the two function s equal to each other and solve. In this case we will be working with a quadratic, so we know that we need to get everything to 1 side and then use the quadratic formula.

OK,….now let's do these 2 steps:

I can find the vertex of a parabola: $x=\frac{-b}{2a}$ **so the vertex is (-2,3) Should be easy!**

Now we are ready for step 2:

$-x^2-4x-1= 3x+11$

$0=x^2 + 7x + 12$

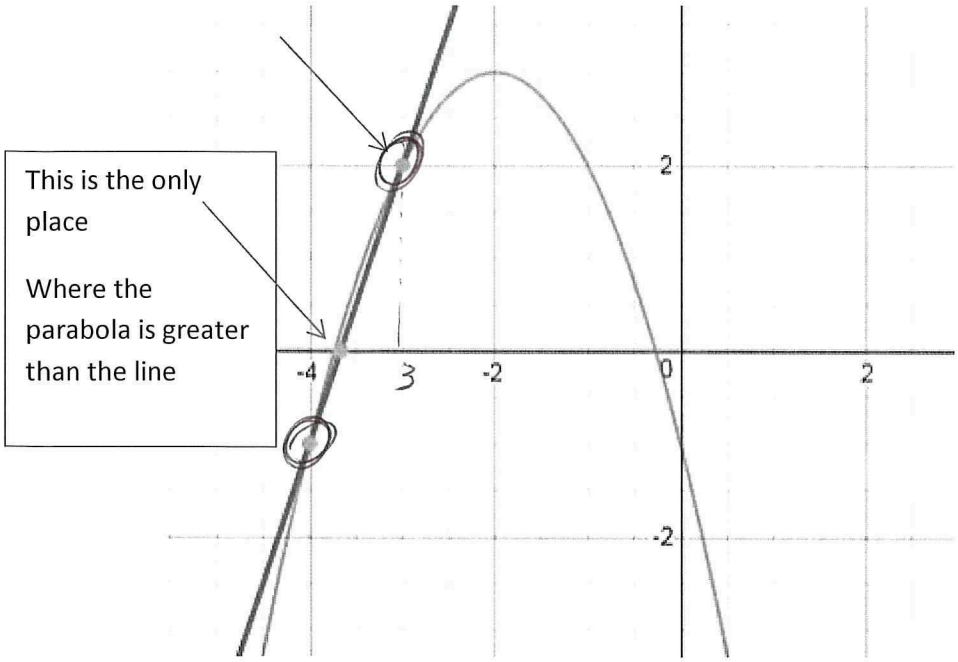
I will now solve this by using the quadratic formula. $x = \frac{-7\pm\sqrt{7^2-4(1)(12)}}{2}$

This gives us $\frac{-7\pm1}{2}$ So the roots in this case are **-3 and -4.** These 2 values are where the parabola and line are equal. Test it out for yourself. Put the quadratic in Y1 and the linear into Y2 and do VARS (-3) you will get 2 for both. Do the same thing for -4 and you will get a y value of -1 for both.

Actually take the time to test that indeed this is true. When you find the corresponding y values you really do see that they are equal at these 2 places!!!! You need to confirm.

OK, now that I know the vertex of the parabola and I know the place where the 2 functions are equal to each other, I should be able to make a pretty good sketch of the graph. That is what you are doing.

Since I know where they are equal and I know the vertex, I can now make the graph of both.



As shown in the graph, the part of the parabola that is above the line is only in a small domain. The x values as shown in the above where the parabola is above the line is when the following is true:

$-4 < x < -3$

So, I can now answer the original question, which was for what x values is the following true:

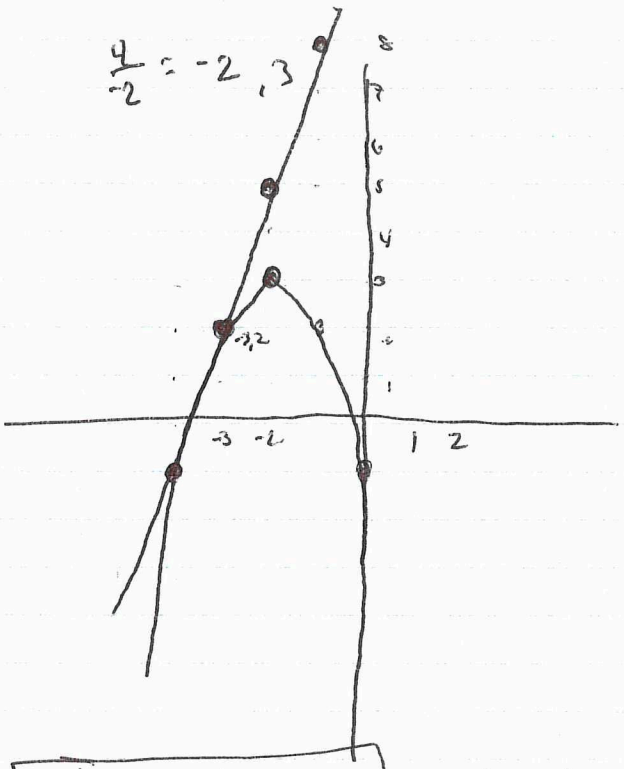
$$-x^2-4x-1<3x+11$$

As shown in the graph this is when

$x < -4$ or when $x > -3$

① $-x^2 - 4x - 1 < +3x + 11$

$\frac{4}{-2} = -2, 3$

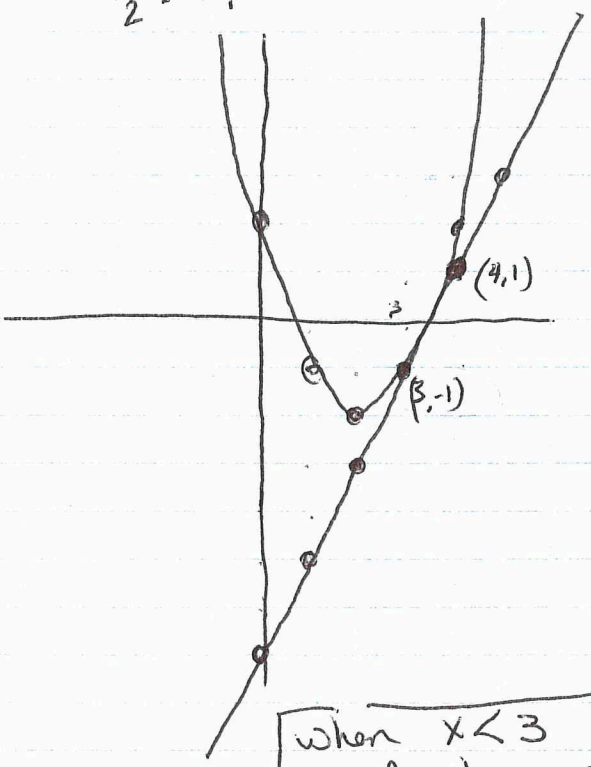


when $x > -3$ and when $x < -4$

The line is greater than the parabola

② $x^2 - 4x + 2 > 2x - 7$

$\frac{4}{2} = 2, -2$



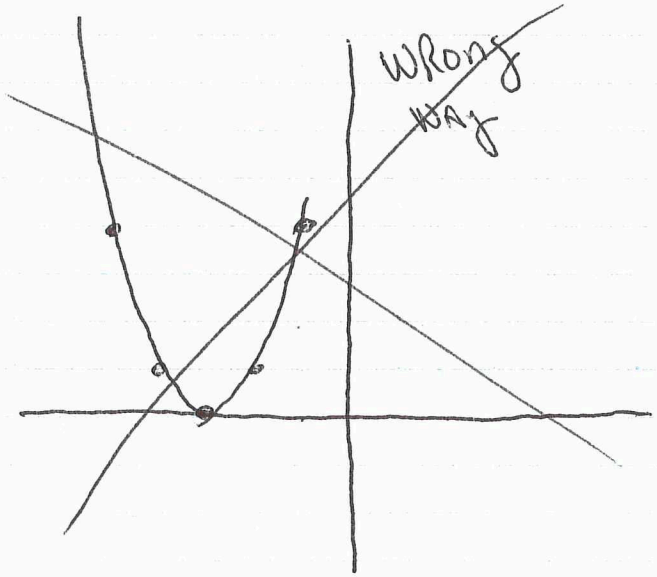
when $x < 3$ and when $x > 4$

The line is greater than Parabola

③ $-x^2 - 6x - 9 > 2x - 6$

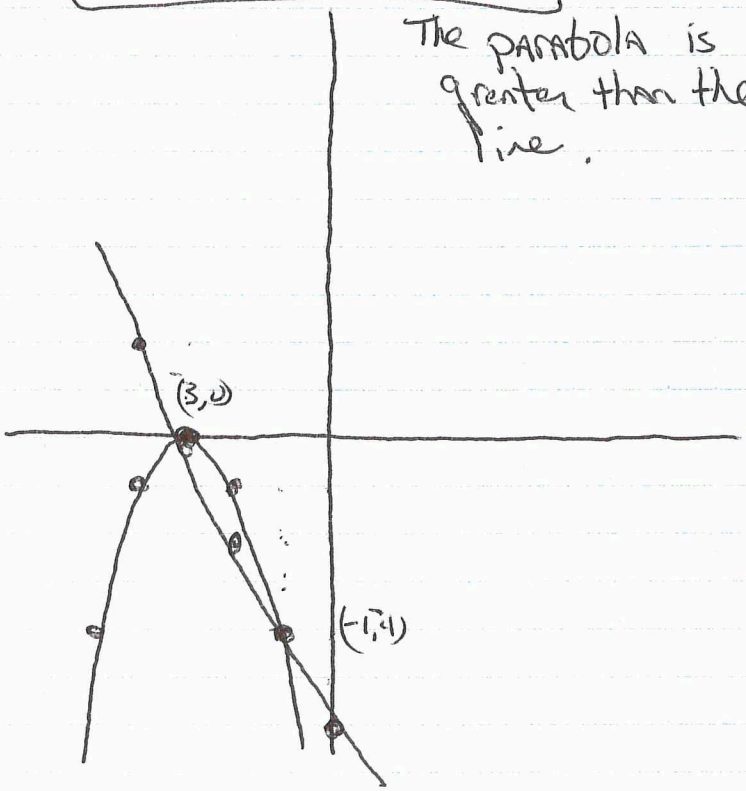
$\frac{6}{-2} = -3$

VARS(-3) 0



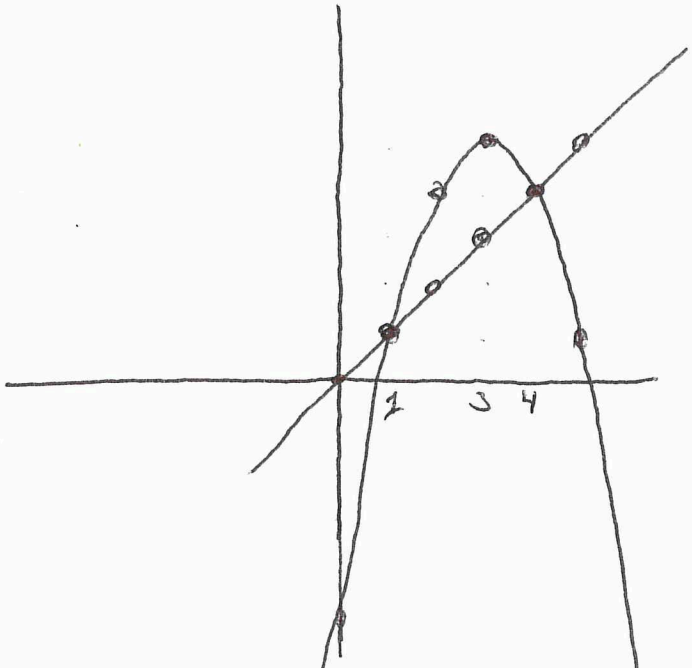
when $-3 < x < -1$

The PARABOLA is greater than the line.



(4) $-x^2+6x-4 > 1x+0$

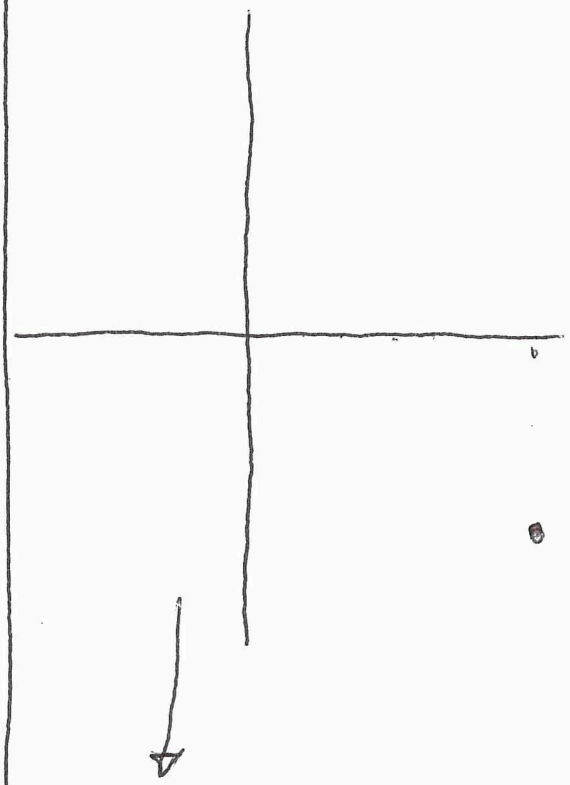
$\frac{-6}{-2} = 3, 5$



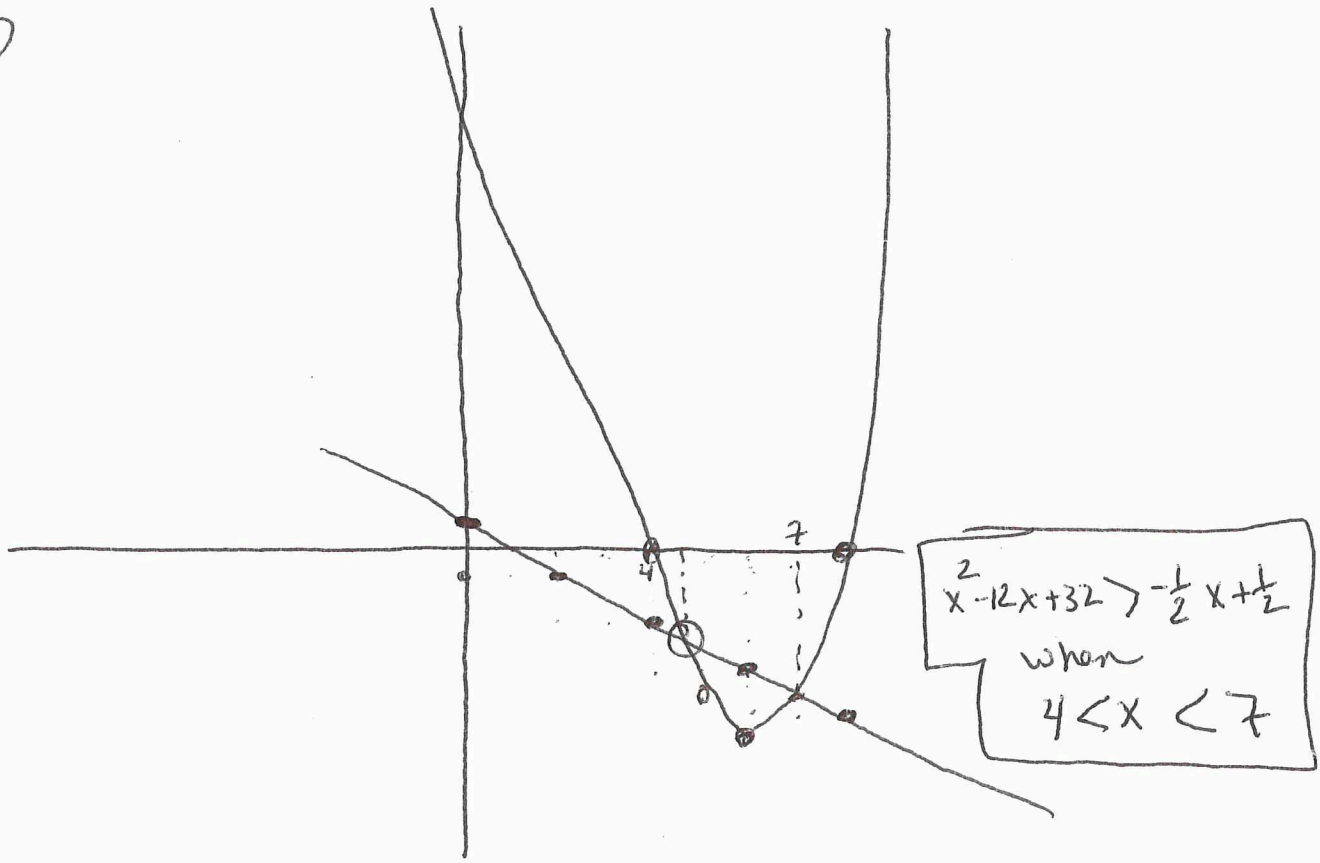
when $1<x<4$ The Parabola is greater than the line

(5) $x^2-12x+32 > -\frac{1}{2}x+\frac{1}{2}$

$\frac{12}{2} = 6$ VARS(6), 4



(5)

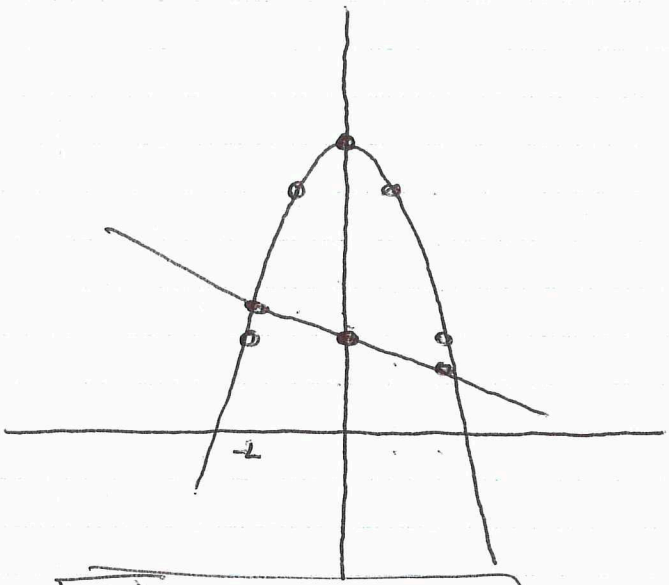


$x^2-12x+32 > -\frac{1}{2}x+\frac{1}{2}$

when

$4<x<7$

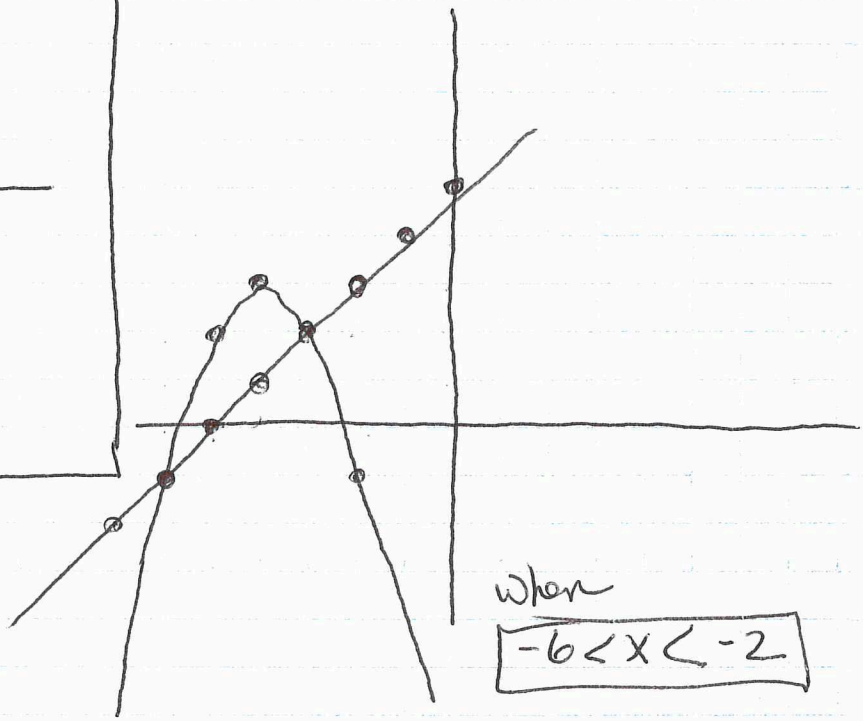
(6) $-x^2+6 > -\frac{1}{2}x+2$



when $-2<x<2.5$

(7) $-x^2-8x-13 > x+5$

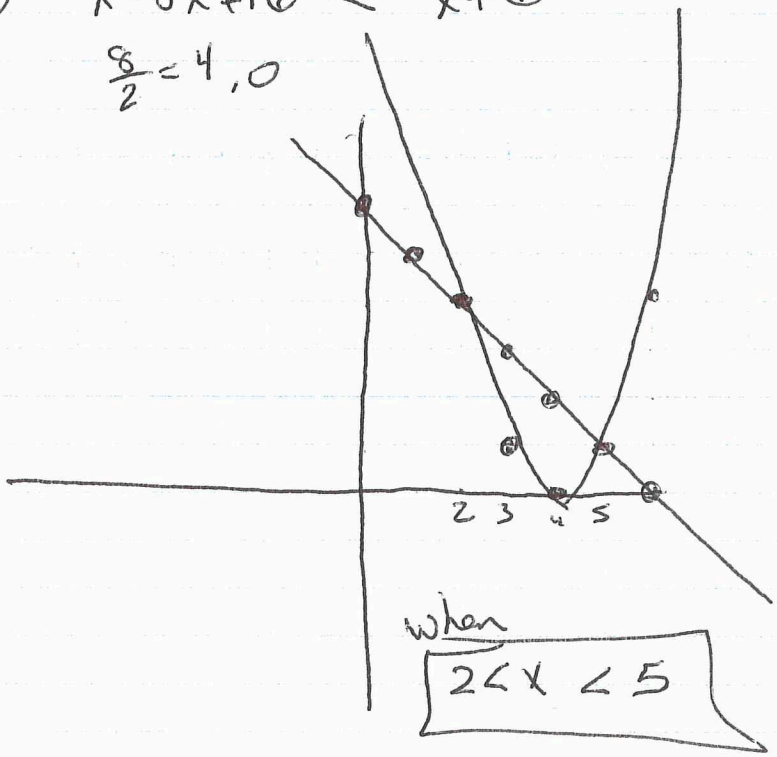
$\frac{8}{-2} = -4, 3$



when $-6<x<-2$

(8) $x^2-8x+16 < -x+6$

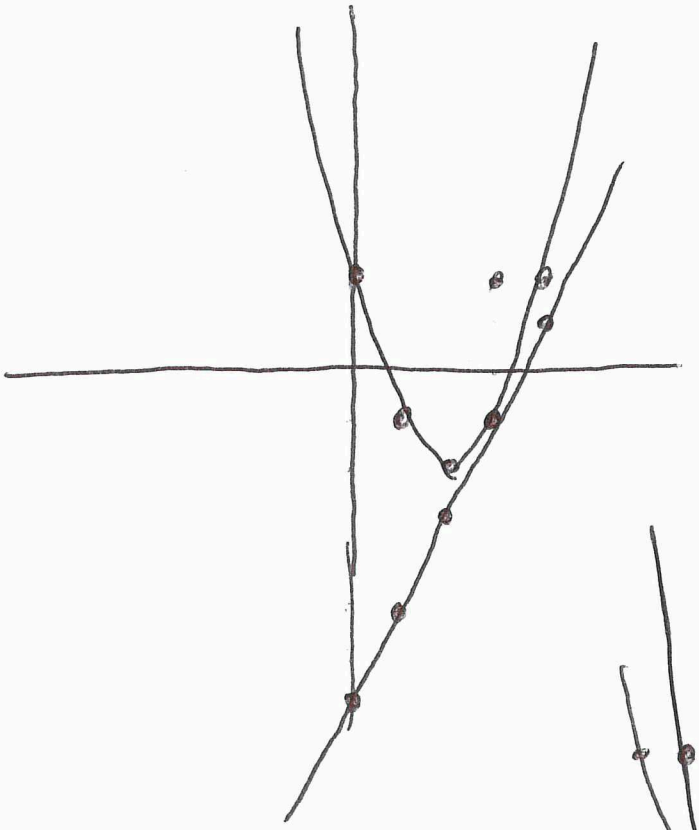
$\frac{8}{2} = 4, 0$

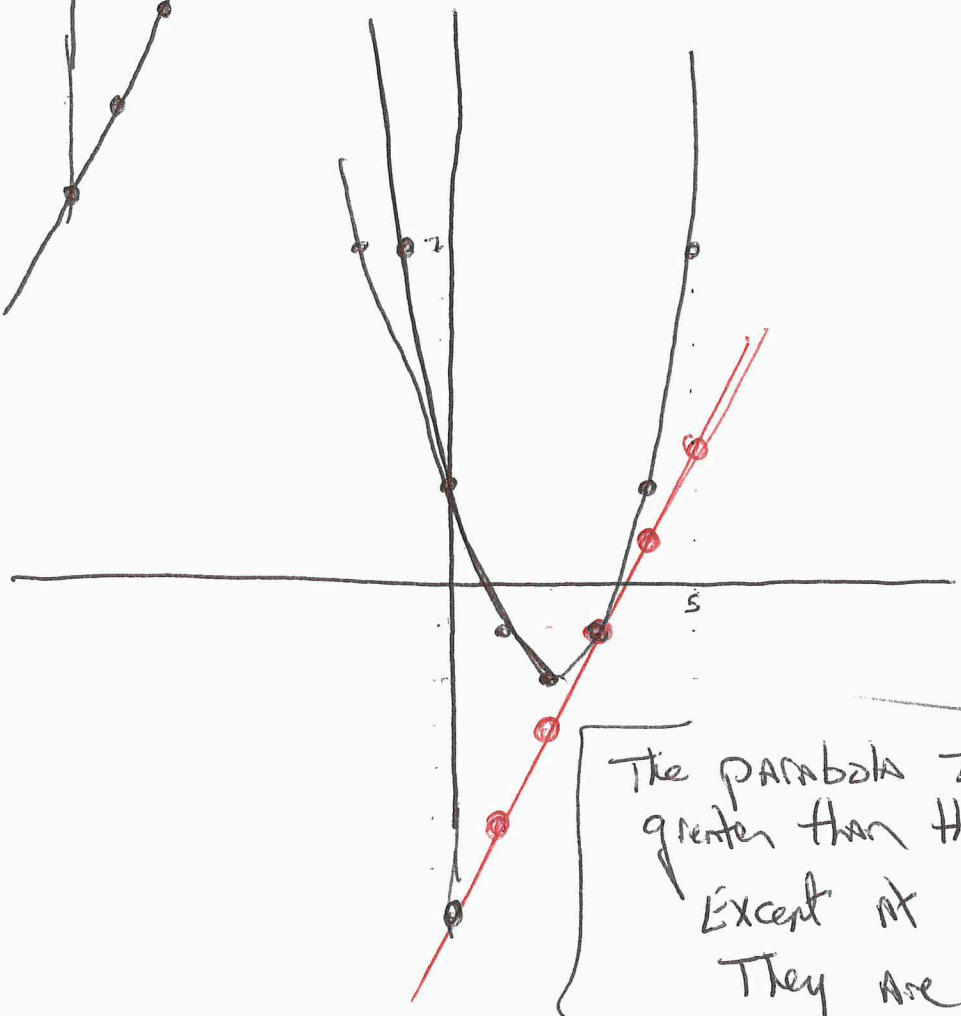


when $2<x<5$

⑨ $x^2 - 4x + 2 > 2x - 7$

$\frac{4}{2} = 2, -2$





The parabola is always greater than the line except at $x = 3$ They are equal

Solve the following Absolute Value

① $4|2x-4| \leq 28$

$|2x-4| \leq 7$

$2x-4 \leq 7$ $\quad$ $2x-4 \geq -7$

$2x \leq 11$ $\quad$ $2x \geq -3$

$x \leq 5.5$ $\quad$ $x \geq -\frac{3}{2}$

$-\frac{3}{2} \leq x \leq 5.5$

② $|4x-16| \geq 32$

$4x-16 \geq 32$ $\quad$ $4x-16 \leq -32$

$4x \geq 48$ $\quad$ $x \leq -4$

$x \geq 12$

$x \leq -4$ OR $x \geq 12$

③ $\frac{3}{4}|x+12| \geq 123$

$|x+12| \geq 164$

$x+12 \geq 164$ $\quad$ $x+12 \leq -164$

$x \geq 152$ $\quad$ $x \leq 176$

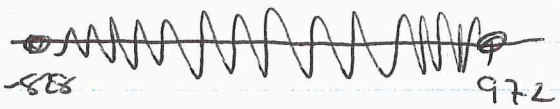
$152 \leq x \leq 176$

④ $\left|\frac{1}{4}x-18\right| \leq 225$

$\frac{1}{4}x-18 \leq 225$ $\quad$ $\frac{1}{4}x-18 \geq -225$

$x \leq 972$ $\quad$ $x \geq -828$

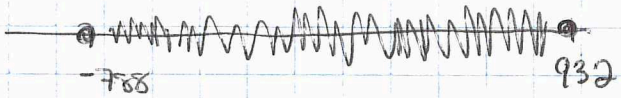
$-828 \leq x \leq 972$



④ $\left|\frac{1}{4}x - 18\right| \leq 215$

$\frac{1}{4}x - 18 \leq 215$ $\quad$ $\frac{1}{4}x - 18 \geq -215$

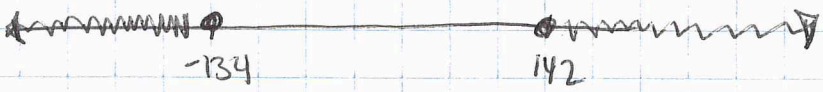
$x \leq 932$ (And) $x \geq -788$



⑤ $|4x - 16| \geq 552$

$4x - 16 \geq 552$ $\quad$ $4x - 16 \leq -552$

$x \geq 142$ or $x \leq$ ~~142~~ -134



⑥ $|x - 18| \geq 45$

$x - 18 \geq 45$ $\quad$ $x - 18 \leq -45$

$x \geq 63$ or $x \leq -27$