PC11 Name_____________________________

Chapter 7 Notes

Inequalities

Date	Topic/Lesson	Assignment
	7.3A - Inequalities in 1 Variable Part 1	After Notes – 7.3A Worksheet AND p.270: 2all
	7.3B - Inequalities in 1 Variable Part 2	After Notes – 7.3B Worksheet AND p.271: 3a-e
	7.5 - Applications of Quadratic Inequalities	After Notes – 7.5 Worksheet AND p281: 13, 14
	Practice Test	Chapter 7 Practice Test
	Review	p.283: 4, 5, 8, 10, 12
	Unit Test	**Chapter 7 Unit Test**

7.3A – Inequalities in One Variable, Part 1

Warmup

How do we read these inequalities (from left to right)? $5 > 2$ $-3 < -1$

What does each symbol mean? $>$ $<$ $\geq$ $\leq$

How do you say this aloud? $x \geq 4$

What are some possible answers?

What is the primary difference between an **equation** and an **inequality**?

Solving Linear Inequalities

Example 1 – Solve the following inequality and graph on a number line: $3x - 7 < -5$

Example 2a – What are some possible answers to $-2x < 6$?

Example 2b – Solve the following inequality and graph on a number line: $-2x < 6$

How is solving an inequality like solving an equation? How is it different?

Quadratic Inequalities

Solving quadratic inequalities requires a new technique, because we cannot just get "x by itself" on one side of the inequality.

There are two approaches we can take to solving quadratic inequalities:

___________________________ and ___________________ ________________________

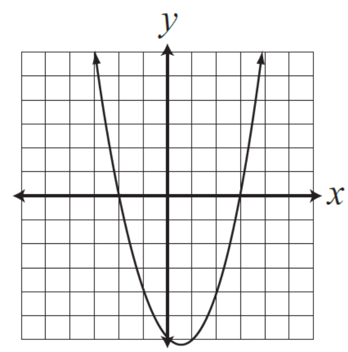
Solving Quadratic Inequalities by Graphing

Example 3 – Use the quadratic function $f(x) = x^2 - x - 6$ and its graph to answer the following:

a) Solve $x^2 - x - 6 = 0$

b) Solve $x^2 - x - 6 < 0$ and graph on a number line.

c) Solve $x^2 - x - 6 > 0$ and graph on a number line.



From the graph, you can see the parabola has

x-intercepts at ______ and _______.

a) Therefore, $x^2 - x - 6 = 0$ when ______________________________________

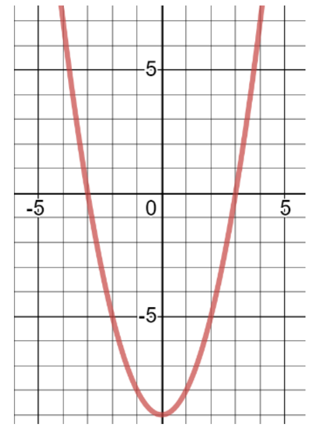
The parabola is BELOW the x-axis when x….

b) Therefore, $x^2 - x - 6 < 0$ when ______________________________________

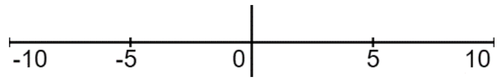
The parabola is ABOVE the x-axis when x…

c) Therefore, $x^2 - x - 6 > 0$ when ______________________________________

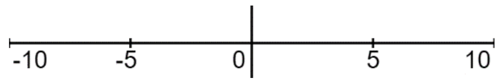
Example 4 – From the graph of the quadratic function $f(x) = x^2 - 9$, state the solution to the following and graph on a number line:



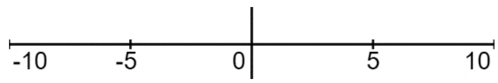
a) $x^2 - 9 = 0$



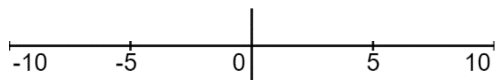
b) $x^2 - 9 \le 0$



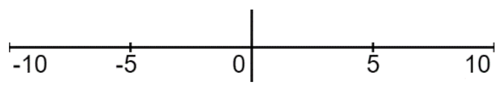
c) $x^2 - 9 < 0$



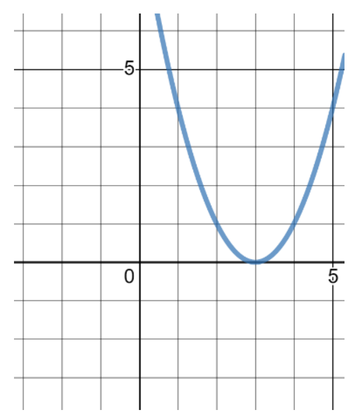
d) $x^2 - 9 \ge 0$



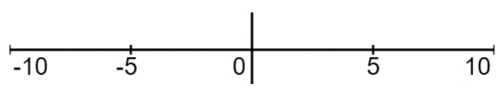
e) $x^2 - 9 > 0$



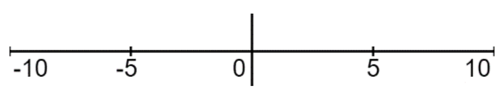
Example 5 – From the graph of the quadratic function $f(x) = x^2 - 6x + 9$, state the solution to the following and graph on a number line:



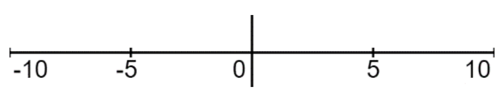
a) $x^2 - 6x + 9 = 0$



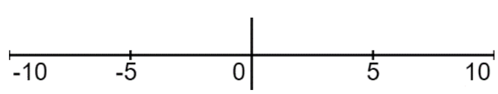
b) $x^2 - 6x + 9 \le 0$



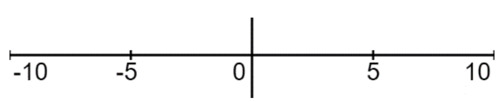
c) $x^2 - 6x + 9 < 0$



d) $x^2 - 6x + 9 \ge 0$



e) $x^2 - 6x + 9 > 0$

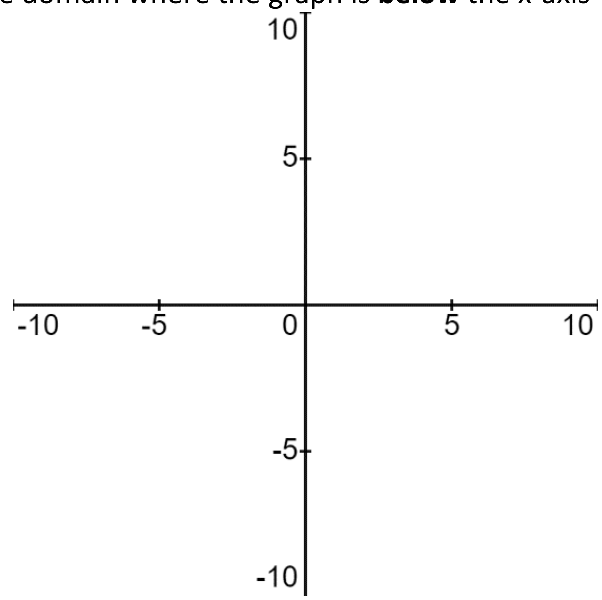


7.3B – Inequalities in One Variable, Part 2

Example 1 – Solve $x^2 + 2x > 8$ **by graphing**, **and then using test intervals**. Graph the solution on a number line.

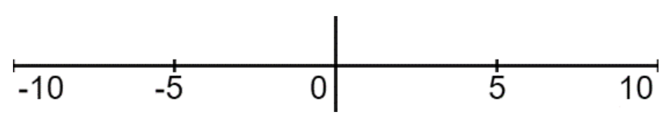
Graphing Steps

1. Get everything to the left side of the inequality so that zero is on the right.
2. Find the roots (*x*-intercepts) of the quadratic.
3. **Sketch** a graph and use the visual to solve the inequality.
   → if the quadratic is > 0, find the domain where the graph is **above** the x-axis
   → if the quadratic is < 0, find the domain where the graph is **below** the x-axis



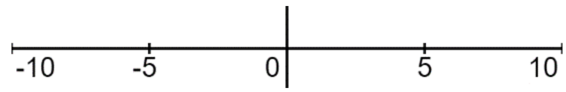
Test Intervals Steps

1. Set inequality to zero. Find the critical numbers (the zeros) of the quadratic.
2. Use the critical numbers to split the domain (x-values) into separate test intervals, and make an *x*-axis diagram of the resulting test intervals. Label each interval.
3. Test a value from each interval using the **original** inequality.

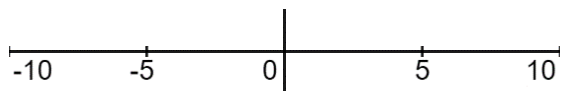


Example 2 – Solve $2x^2 - 7x - 15 \leq 0$ using both methods and graph the solution on a number line.
*if the quadratic is ≥ 0, find the domain where the graph is **above or on** the x-axis
*if the quadratic is ≤ 0, find the domain where the graph is **below or on** the x-axis

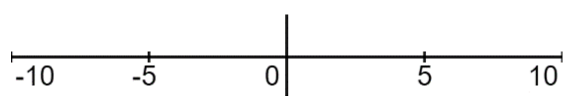
Graphing:



Test Intervals:



Example 3 – Solve $x^2 + 1 > 3x$. Then graph the solution on a number line.



7.5 – Applications of Quadratic Inequalities

Example 1 – The height in meters of a projectile shot from the top of a building is given by $h(t) = -16t^2 + 60t + 25$, where t represents the time in seconds the projectile is in the air. Find the time interval that the projectile is above 25m, to the nearest hundredth.

Example 2 – The sale price of a stereo is given by the function

$$S(x) = 200 - 0.1x, \quad 0 \leq x \leq 2000$$

where x is the number of stereos produced each day. It costs \$18 000 per day to operate the factory and \$15 for material to produce each stereo.

a) Find the equation for the daily revenue.

b) Find the equation for the daily cost of producing stereos.

c) Find the interval that produces a profit.