PreCalculus Name: Period: Date:

Warm Up 4/18

<u>Lesson 9-9: Systems of Inequalities</u>

Objectives
Students will…
- Be able to sketch the graphs of any system of inequalities.
- Be able to define and determine whether the solution region is bounded or unbounded.

System of Inequalities
We have just refreshed our mind about graphing inequalities with ______________________ of possible solutions. We will now refresh our minds on **<u>systems of inequalities</u>**, which are sets of ____________________ **<u>inequalities</u>**.

Ex. $\left\{\begin{matrix} -\frac{1}{2}x^2 + y \geq -2 \\ x - y < 0 \\ x < -1 \\ y \geq 0 \end{matrix}\right\}$

We will see that when dealing with a system of inequalities, we simply need to **<u>sketch the graph</u>** of each inequality ____________________________, and **<u>analyze</u>** them altogether _________________________.

Non-linear Inequalities
First off, we need to know how to graph non-linear inequalities (power > 1). For example, consider…

$y \leq x^2$ and $y > x^2$

As you can see, when inequalities are involved, _______________ line represents **<u>greater than</u>** or **<u>less than</u>**, while ________________ line represents the "**<u>or equal to</u>**."

Equation of a Circle
Another equation that we must familiarize ourselves with is the **<u>equation of a _______________</u>**. We will study this much more in depth in the next chapter, so for now our goal is to being able to identify them and graphing them. For this unit, they will take the form: $x^2 + y^2 = r^2$, where r represents the _____________ of the circle.

Ex. $x^2 + y^2 = 25$ is the equation of a circle centered at the origin, $(0,0)$, having the radius of $\sqrt{25} = 5$. Let's graph this!

Example

So now let's graph a system of inequalities.

$\left\{\begin{matrix} y \geq -x^2 \\ x - y > 4 \end{matrix}\right\}$

As you can see, we simply need to shade the **<u>region that both graphs share</u>** as possible solutions.

Example

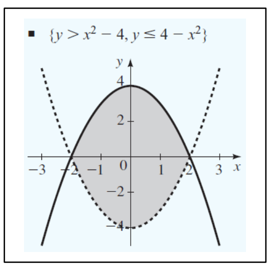
$$\begin{Bmatrix} x + 2y \geq 5 \\ x^2 + y^2 < 25 \end{Bmatrix}$$

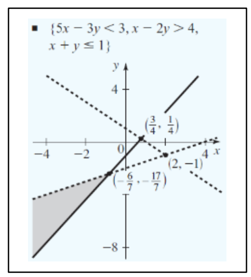
$$\begin{Bmatrix} x + y \geq 3 \\ -2x + y \leq 5 \\ x - 2y \leq 12 \end{Bmatrix}$$

Bounded vs Unbounded

As you can see, the solution regions in the first and the last example seem to go on for **infinity**, i.e. there is no boundary, while the region in the second example appears to have a set of boundaries.
Regions that have no boundaries are said to be **unbounded** (first and third example), while regions that have boundaries are said to be **bounded** (second example).

Ex. **Bounded** **Unbounded**





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