Lesson 13: Linear Programming

By the end of the lesson, you will be able to:

~ Solve a linear programming problem.
~ Find a maximum or minimum of a linear programming problem.

Lesson 13: Linear Programming

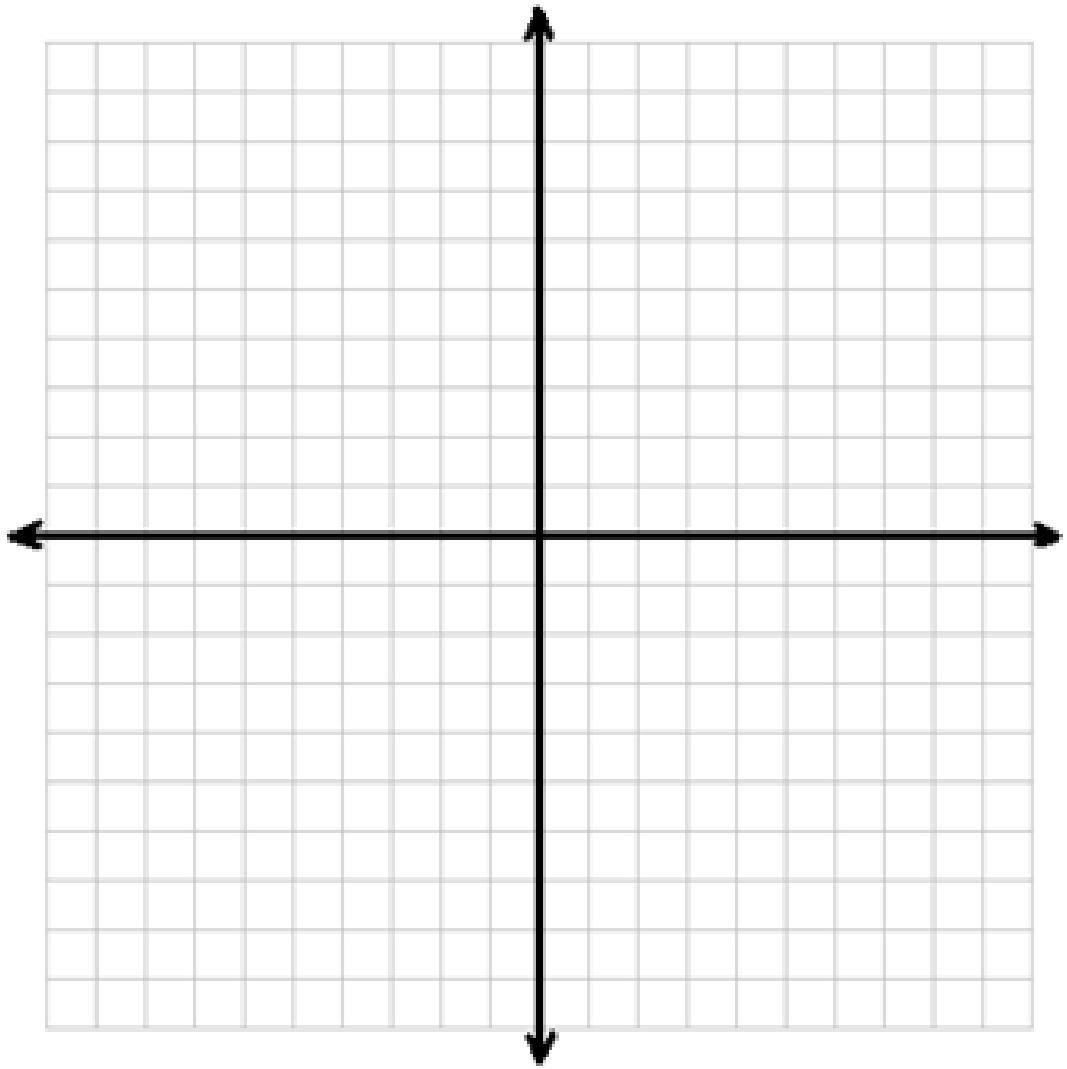
~Review~

Graph the following system of inequalities (x and y int):

$$x - 3y \geq -9$$

$$4x - y \leq 4$$

$$x + 2y \geq -2$$



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$x - 3y \geq -9$ $\quad$ $4x - y \leq 4$ $\quad$ $x + 2y \geq -2$

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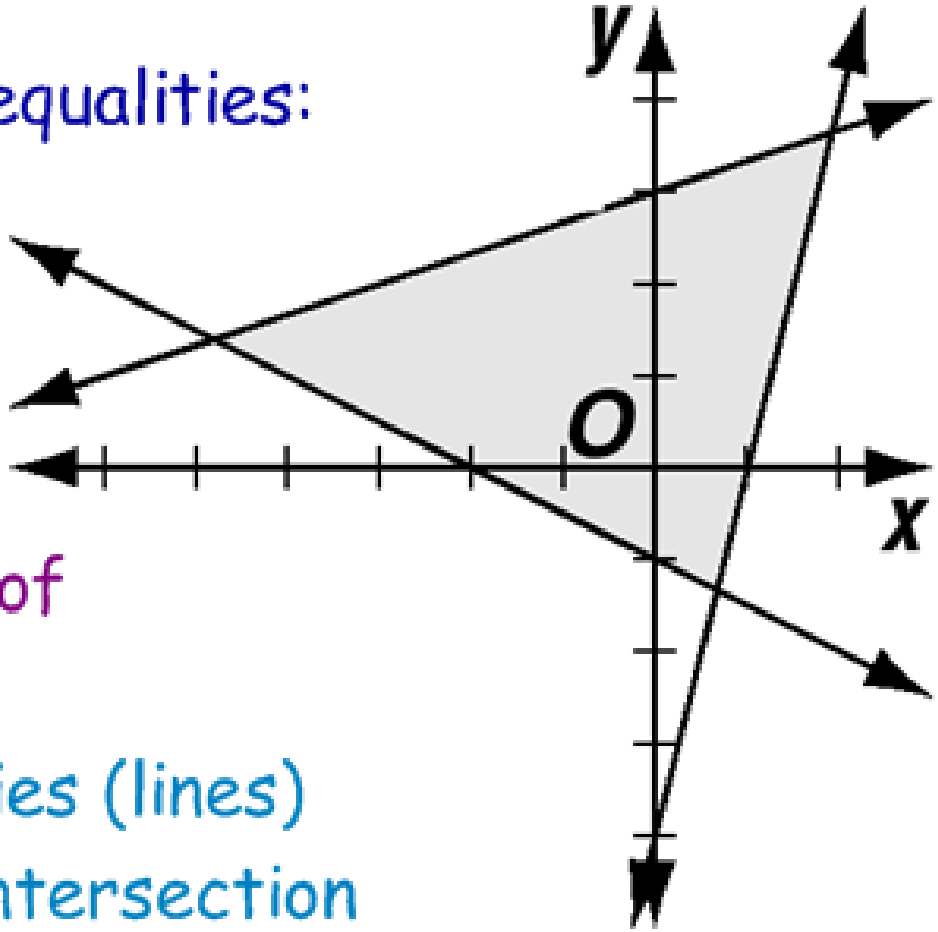
Using the same systems of inequalities:

$$x - 3y \geq -9$$

$$4x - y \leq 4$$

$$x + 2y \geq -2$$



There are 3 parts to systems of inequalities:

1. Constraints: the inequalities (lines)
2. Vertices: The points of intersection
3. Feasible Region: The shaded region

~Label each part on the given graph~

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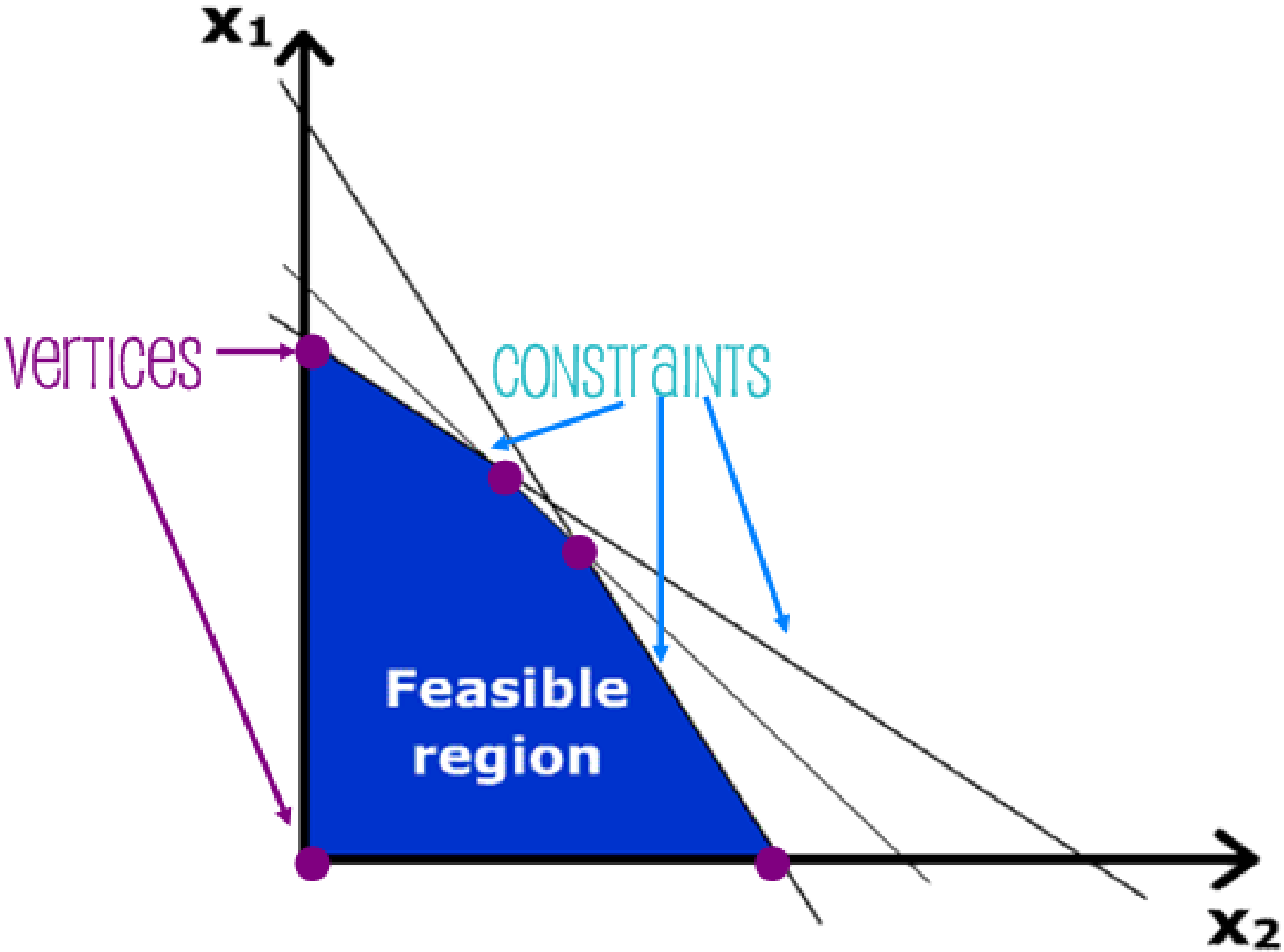

Linear Programming

is a process of finding a maximum or minimum of a function by using vertices of the polygon formed by the graph of the constraints.

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~New notation~

$f(x)=y$

example: $y=x+2$ can also be written as $f(x)=x+2$

So if we were wanting to find out what y is when $x=50$, we can re-write this as $f(50)=50+2$. therefore, $f(50)=52$ or when $x=50$, $y=52$.

~So we know that (50, 52) is a solution to $y=x+2$~

Example:

if $f(x)=6x-4$, what is $f(2)$?

What is $f(10)$?

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~SIMILARLY~

If $f(x,y)=2x+y$

how would we find $f(3,4)$?

We would plug 3 in for x and 4 in for y, so we would get:

$f(3,4)=2(3)+4$

Example:

if $f(x,y)=5x-4y$, what is $f(2,1)$?

What is $f(6,3)$?

Finding Maximums and Minimums of Linear Programming:

Follow these four steps:

1. Graph the inequalities.
2. Find the vertices of the feasible region.
3. Use a chart to find the max & min values of the function.

(X,Y)	FUNCTION EQUATION	F(X,Y)

4. The point which has the biggest f(x,y) is the max. The point that has the smallest f(x,y) is the min.

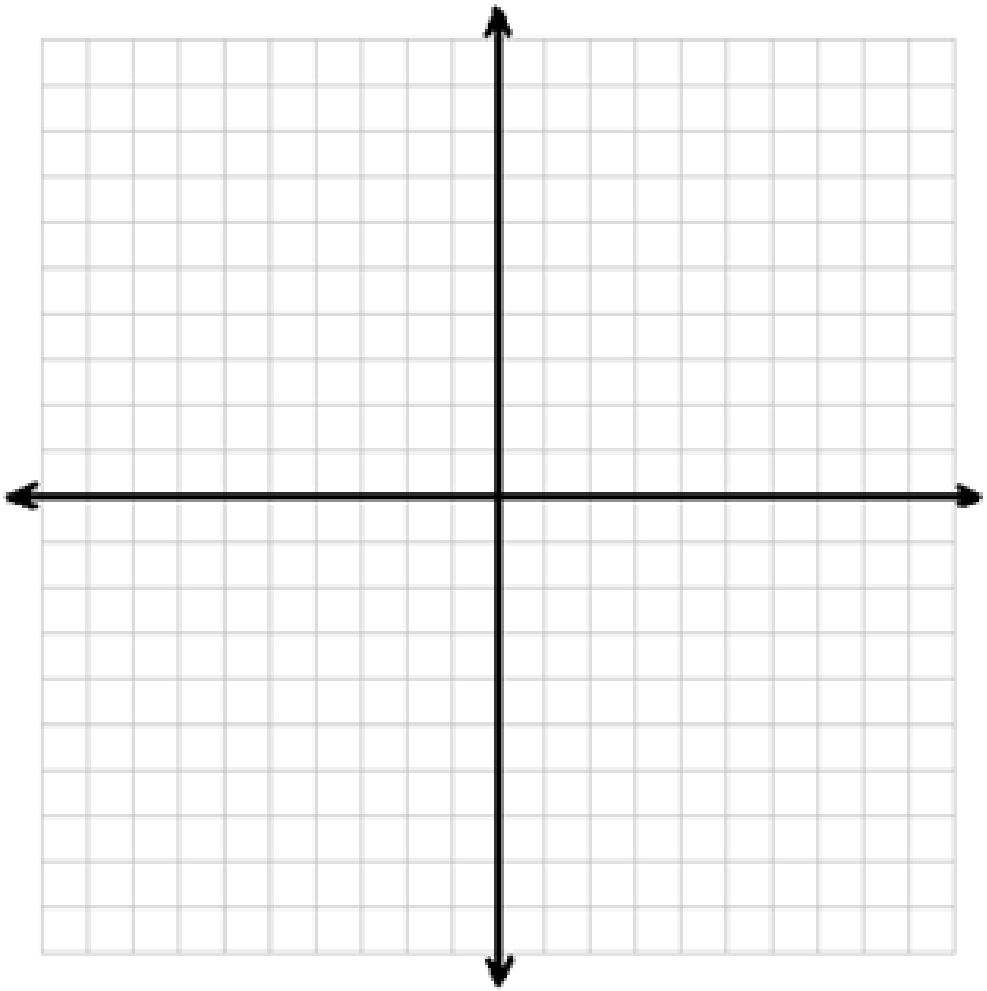
Example 1: Find the Max and Min for the polygonal region. Use the following equation: $f(x, y) = 2x - 3y$

$x \geq 1$

$y \geq 2$

$x + 2y \leq 9$

What are the vertices?



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Work for Example 1: (x and y int so you can graph)

$x \geq 1$ $y \geq 2$ $x + 2y \leq 9$

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Work for Example 1: (Put vertices in chart so you can find the Maximum and Minimum.) $f(x, y) = 2x - 3y$

(X,Y)	2X-3Y	F(X,Y)

The Maximum is:

The Minimum is:

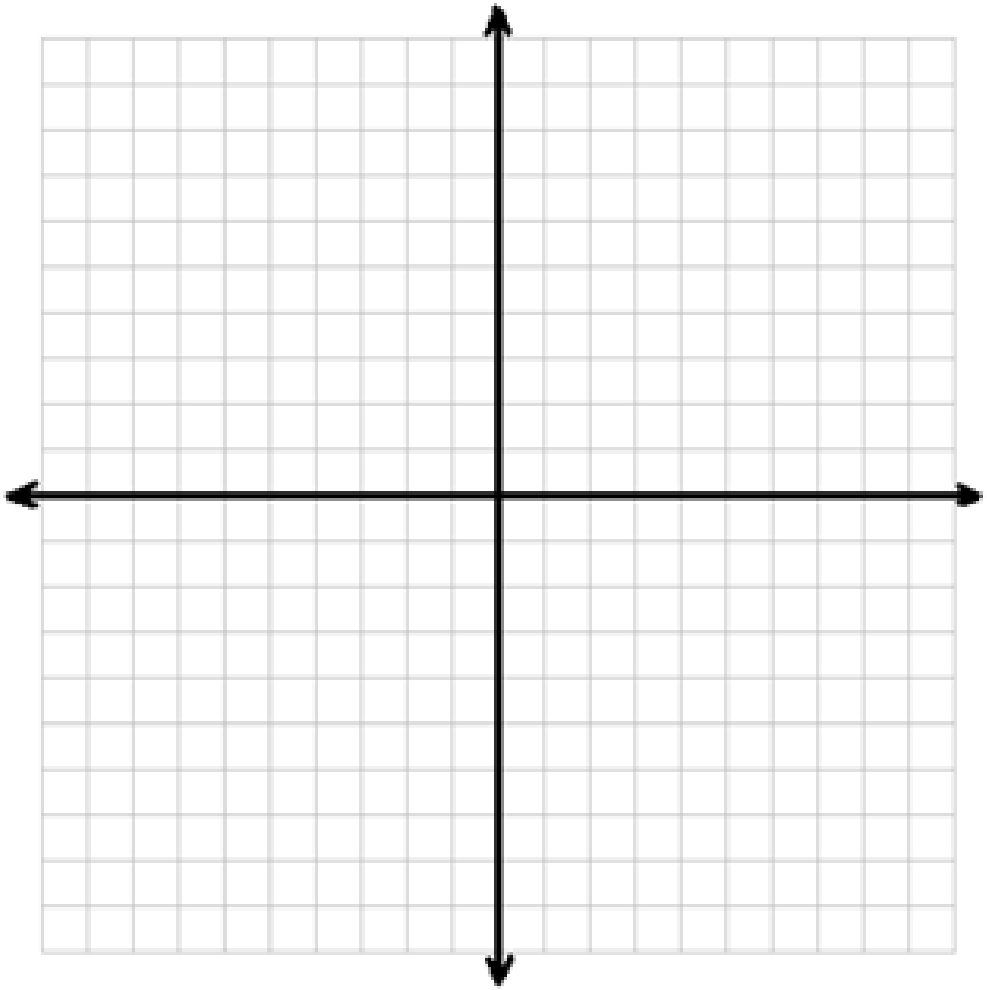
Example 2: Find the Max and Min for the polygonal region. Use the following equation: $f(x, y) = -2y + 3x$

$y \geq 2$

$1 \leq x \leq 5$

$y \leq x + 3$

What are the vertices?



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Work for Example 2: (x and y int so you can graph)

$y \geq 2$ $\quad$ $1 \leq x \leq 5$ $\quad$ $y \leq x + 3$

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Work for Example 2: (Put vertices in chart so you can find the Maximum and Minimum.) $f(x, y) = -2y + 3x$

(X,Y)	3X-2Y	F(X,Y)

The Maximum is:

The Minimum is:

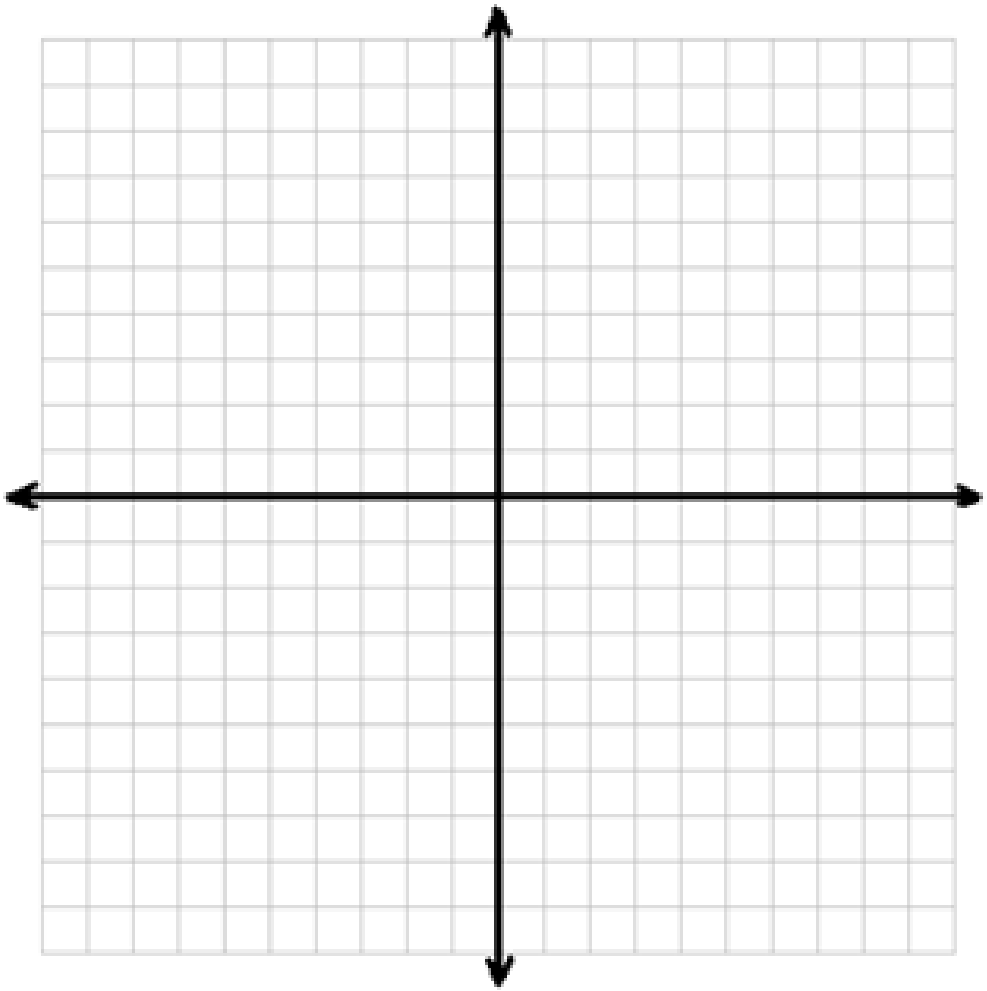
Example 3: Find the Max and Min for the polygonal region. Use the following equation: $f(x, y) = 5x + 2y$

$x - 3y \leq 0$

$x - 3y \geq -15$

$4x + 3y \geq 15$

What are the vertices?



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Work for Example 3: (x and y int so you can graph)

$x - 3y \leq 0$ $\quad$ $x - 3y \geq -15$ $\quad$ $4x + 3y \geq 15$

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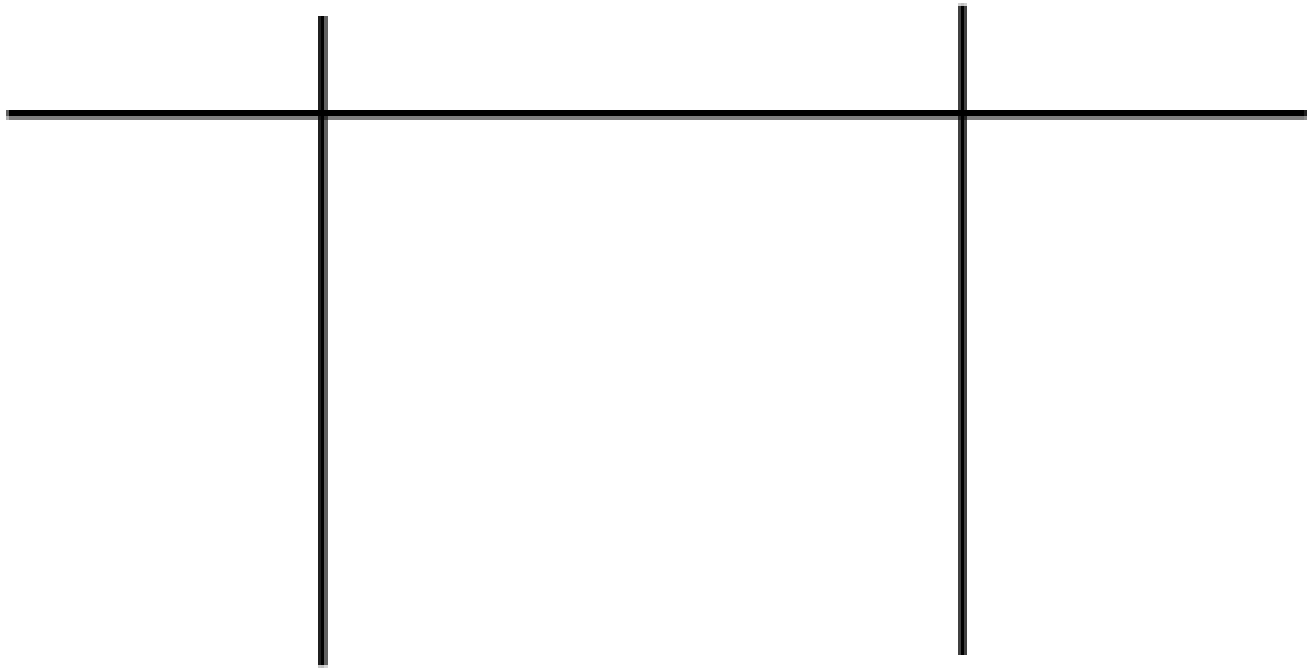
Work for Example 3: (Put vertices in chart so you can find the Maximum and Minimum.) $f(x, y) = 5x + 2y$



The Maximum is:

The Minimum is:

Example 4: Find the Max and Min for the polygonal region. Use the following equation: $f(x, y) = x - 2y$

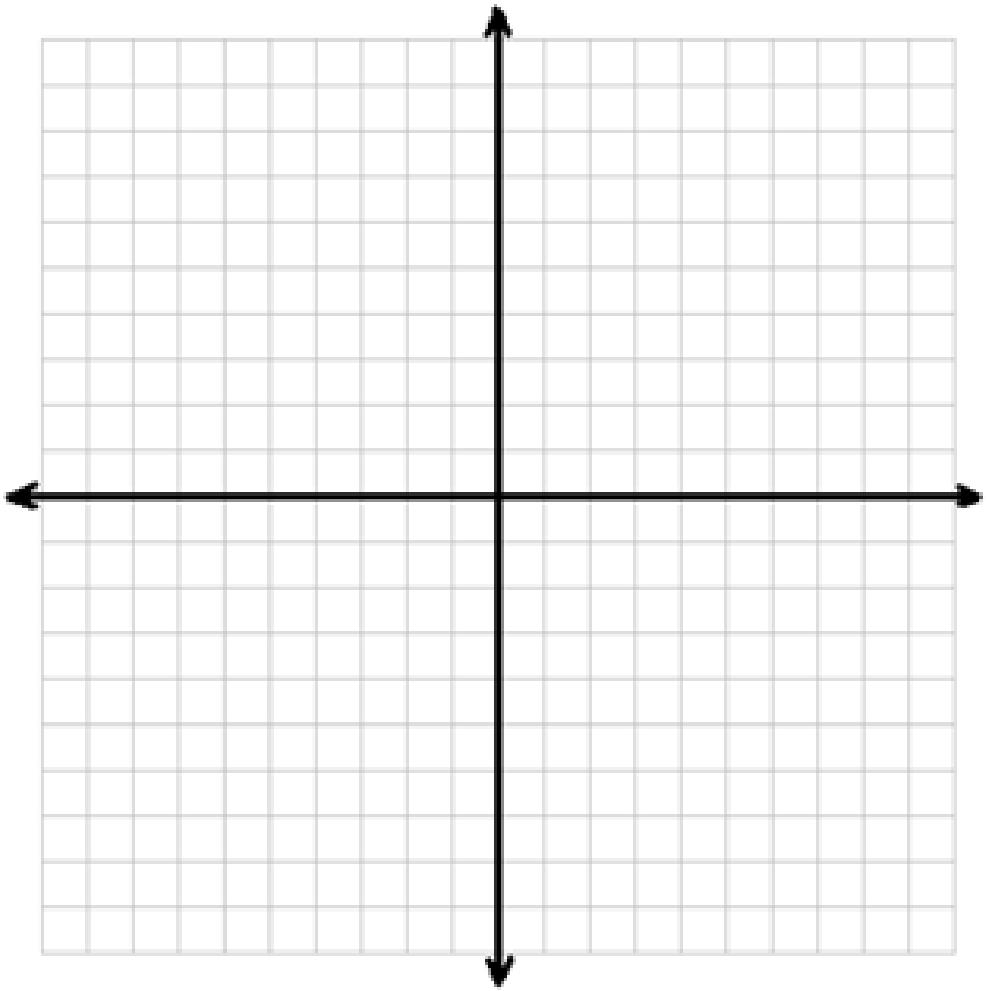
$y \leq x + 5$

$y \geq x$

$x \geq -3$

$y + 2x \leq 5$

What are the vertices?



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Work for Example 4: (x and y int so you can graph)

$y \leq x + 5$ $\quad$ $y \geq x$ $\quad$ $x \geq -3$ $\quad$ $y + 2x \leq 5$

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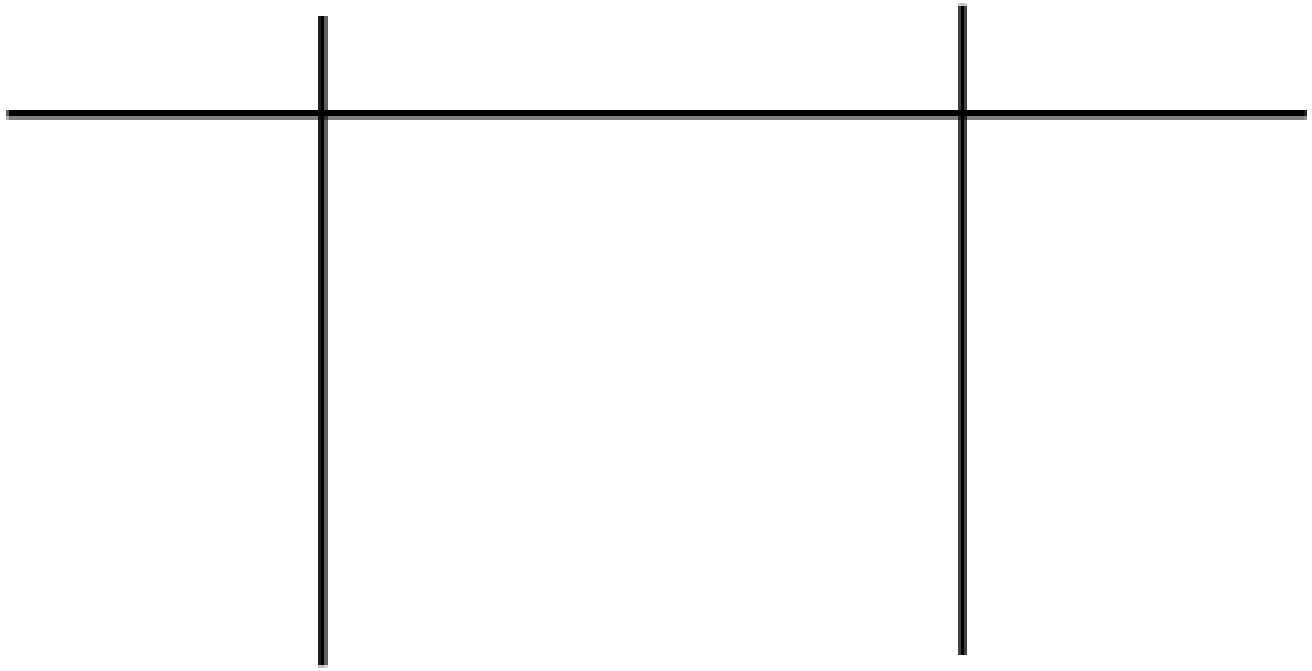
Work for Example 4: (Put vertices in chart so you can find the Maximum and Minimum.)



The Maximum is:

The Minimum is:

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By the end of the lesson, you will be able to:

~ Solve a linear programming problem.
~ Find a maximum or minimum of a linear programming problem.

Can you?

Homework:

Test Review 3 worksheet

Due next time (test day)

~Assignment #13~

Due day after test

You may use a calculator to find the vertices.

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