**Optimization of a Function**

* Optimization involves determining the best result (vertex) of the polygon of constraint
* The optimal answer will either produce a maximum or minimum depending on the type of problem
* If there is more than one answer (vertex) that optimizes the situation, then every point along that line is considered an answer as well.

**Example #1**

X ≥ 1

Y ≤ 5

3y ≥ x

Y ≤ -x + 6

**Step 1 – Make sure all the inequalities are in function form (y=ax+b)**



X ≥ 1



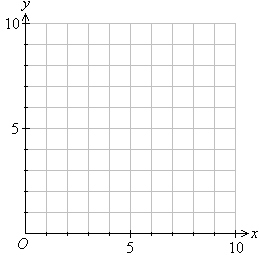
Y ≤ 5



3y ≥ x y ≥ x + 0



Y ≤ -1x + 6

**Step 2 – Graph the inequalities & shade the common area**

X ≥ 1

Y ≤ 5

y ≥ x

Y ≤ -x + 6

A

B

C

**Step 3 – Determine the coordinates of your vertices using a system of equations (comparison method)**

Vertex A is a given because x = 1 and y = 5 ,therefore the vertex A is (1,5)

**Vertex B**

Y ≥ x & Y ≤ -x + 6

x = -x + 6

Make equations equal to one another

x + x = 6

LOL (Letters on Left) – Numbers on Right

x= 6

Solve for x

x=

X = 4.5 or

Y ≤ -x + 6

Y ≤ -(4.5) + 6

Plug “x” into one of the equations

Y ≤ -4.5 + 6

Y ≤ 1.5

Vertex B is located at (4.5, 1.5)

**Vertex C**

Y ≥ x & X ≥ 1

Since you have x ≥ 1

Plug the value of x into the other equation to solve for y

Y ≥ x

Y ≥ (1)

Y ≥

Vertex C is located at (1, )

**Step 4 – Determine the optimal value (min or max) using the optimizing function**

Example of an optimizing function Revenue = 3x + 8y

|  |  |
| --- | --- |
| **Vertices** | **Revenue = 3x + 8y** |
| A (1,5) | 3(1) + 8(5) = 43 |
| B (4.5, 1.5) | 3(4.5) + 8(1.5) = 25.5 |
| C (1, ) | 3(1) + 8() = 5. |

**Example #2**

Y ≤ 3x – 3

Y ≥ + 4

Y ≥ – 3

Y ≤ + 7.5

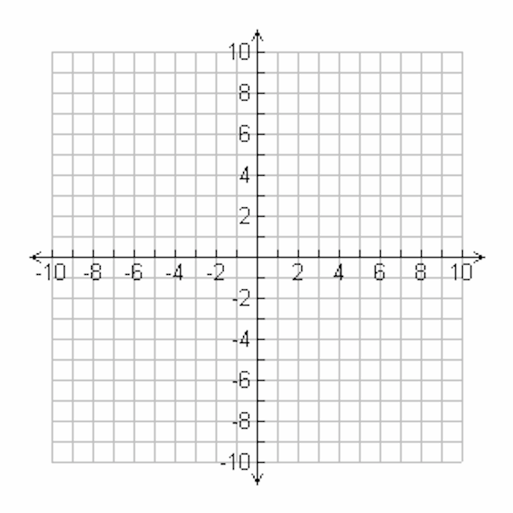
**Step 1 – Make sure all the inequalities are in function form (y=ax+b)**

Y ≤ 3x – 3

Y ≥ + 4

Y ≥ – 3

Y ≤ + 7.5

**Step 2 – Graph the inequalities & shade the common area**

A

D

B

C

**Step 3 – Determine the coordinates of your vertices using a system of equations (comparison method)**

Vertex A

Y ≤ 3x – 3 & Y ≤ + 7.5

3x – 3 = + 7.5

3x + = 7.5 + 3

=

7x • 1 = 2 • 10.5

7x = 21

X = 3

Y ≤ 3x – 3

Y ≤ 3(3) – 3

Y ≤ 9 – 3

Y ≤ 6

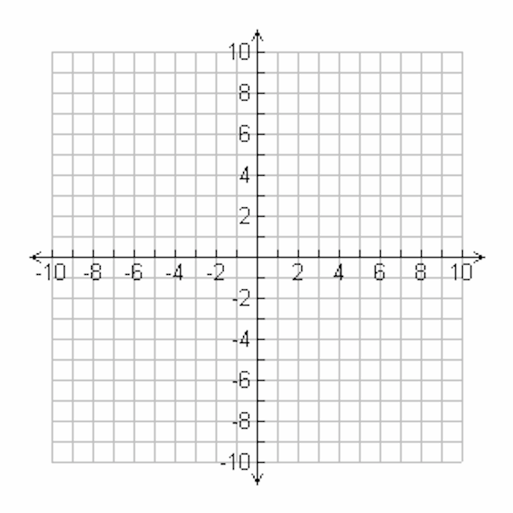
A (3,6)

Find the coordinates of B, C and D

**Step 4 – Determine the optimal value (min or max) using the optimizing function**

|  |  |
| --- | --- |
| Vertex | R = 3x + 6y |
| A (3,6) | 3(3) + 6(6) = 45 |
| B (9,3) | 3(9) + 6(3) = 45 |
| C (6,1) | 3(6) + 6(1) = 24 |
| D (2,3) | 3(2) + 6(3) = 24 |

Because 2 points produce a optimal (maximum) revenue, the answer will be ALL points on the line between points A and B

\*go look at all the graph and pick out ALL the points between A and B (including A and B)\*

A

B