Linear Programming – Day 1
Notes

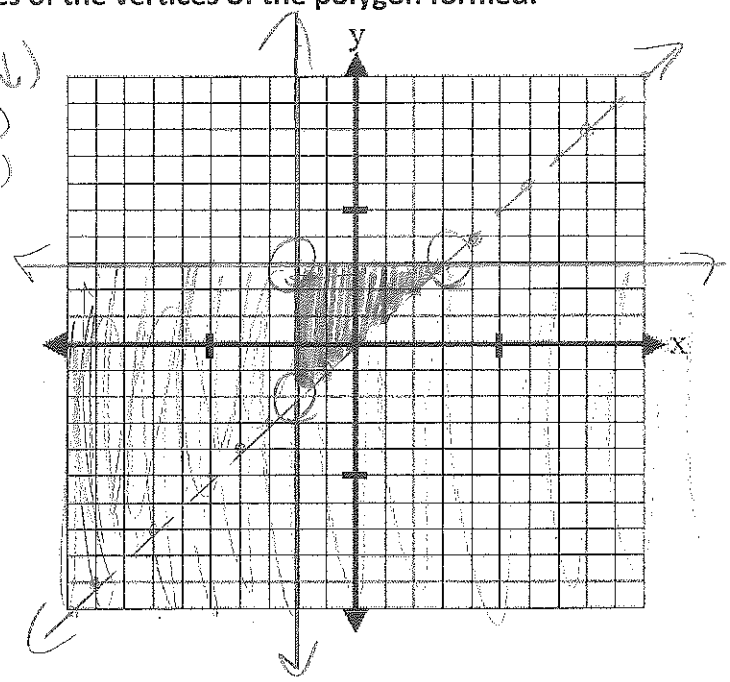
Name: Key

- *Linear programming* is a process of finding a maximum or minimum of a function by using vertices of the polygon formed by the graph.

- The *feasible region* is the region of the graph in which all the constraints are met.

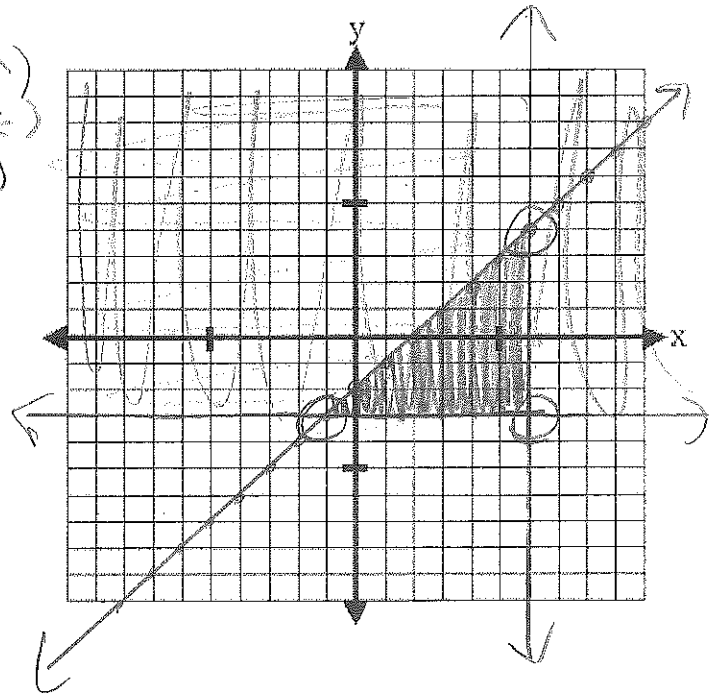
Graph each system of inequalities. Name the coordinates of the vertices of the polygon formed.

1. $y \leq 3$ → horiz. line at 3 (solid, shade ↓)
   $y > x$ m=1, b=0 (dashed, shade ↖)
   $x \geq -2$ → vert. line at -2, (solid, shade →)



Coordinates of vertices: (-2, 3), (-2, -2), (3, 3)

2. $y \geq -3$ → hor line at -3 (solid, shade ↑)
   $x \leq 6$ – vert line at 6 (solid, shade ←)
   $y \leq x - 2$ m=1, b=-2 (solid, shade ↓)



Coordinates of vertices: (-1, -3), (6, 4), (6, -3)

3. $y + x \le 3$ (3,0) (0,3) test (0,0) ⇒ works so shade side w/ (0,0)

$y - x \le 3$ (−3,0) (0,3) (0,0) ⇒ works

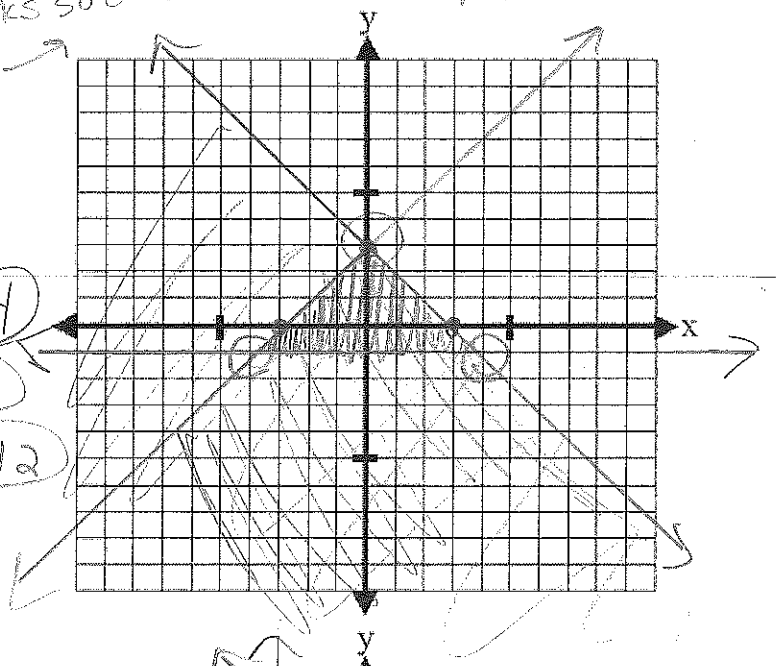
$y \ge -1$ ⇒ horiz. line at −1,

$f(x,y) = -2x + 4y$

Vertices	Function Value
(−4,−1)	−2(−4)+4(−1)=4
(0,3)	−2(0)+4(3)=12
(4,−1)	−2(4)+4(−1)=−12

Maximum: 12 at (0,3)

Minimum: −12 at (4,−1)



4. $x \ge -3$

$y + x \le 6$ (6,0) (0,6) – shade side w/ (0,0)

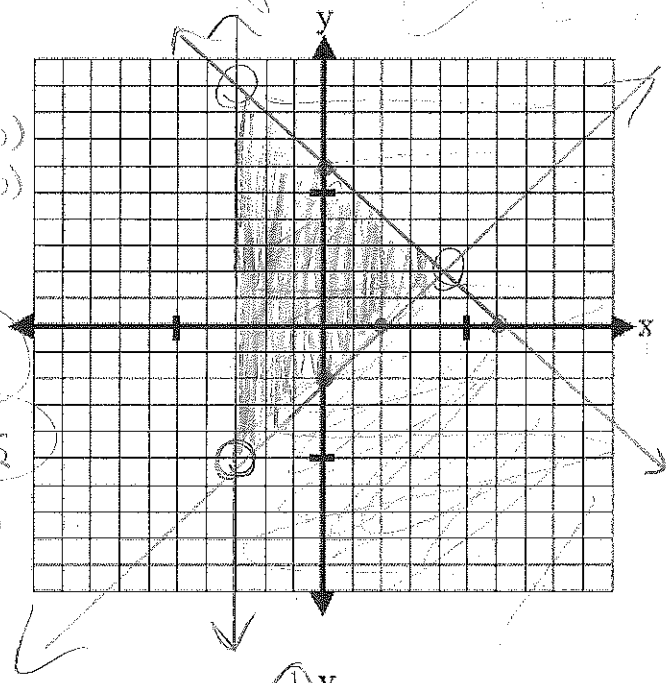
$y - x \ge -2$ (2,0) (0,−2) – shade side w/ (0,0)

$f(x,y) = \frac{1}{2}x - 5y$

Vertices	Function Value
(−3,9)	$\frac{1}{2}(-3)-5(9)=-46\frac{1}{2}$
(−3,−5)	$\frac{1}{2}(-3)-5(-5)=23\frac{1}{2}$
(4,2)	$\frac{1}{4}(4)-5(2)=-8$

Maximum: $23\frac{1}{2}$ at (−3,−5)

Minimum: $-46\frac{1}{2}$ at (−3,9)

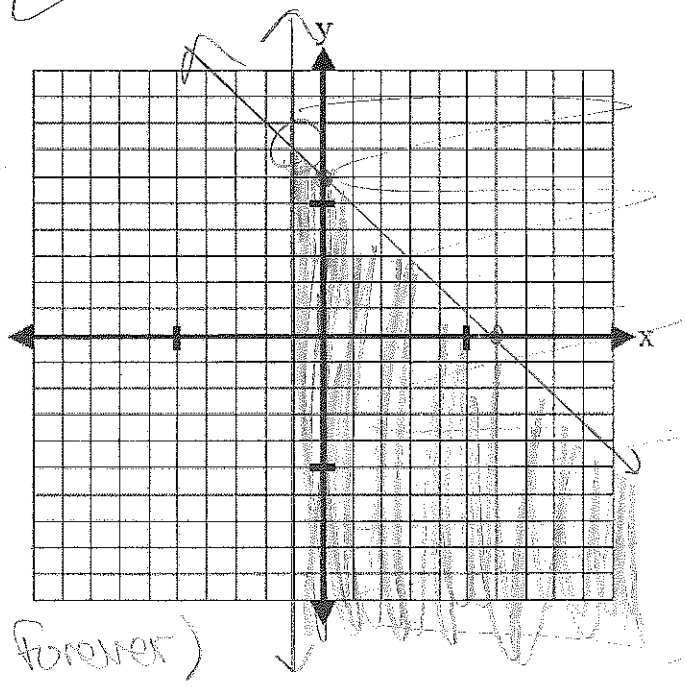


5. $x \ge -1$

$x + y \le 6$ (6,0) (0,6) shade (0,0) side

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

Vertices	Function Value
(−1,7)	−1+2(7)=13

Maximum: 13 at (−1,7)

Minimum: None (it keeps going down forever)