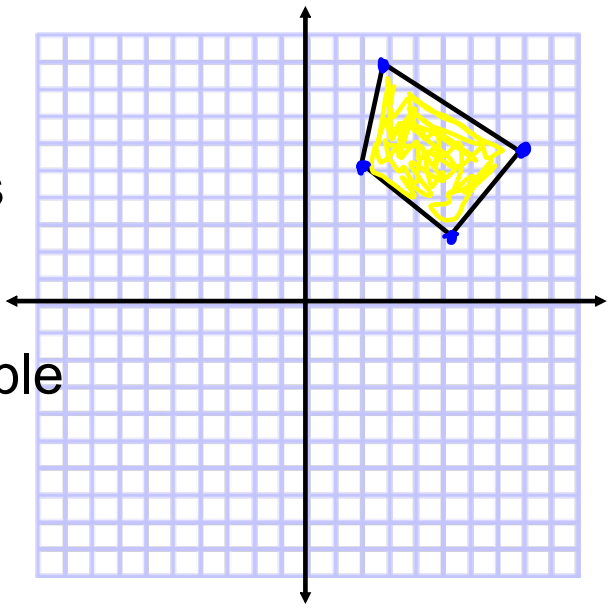
Section 3-4
Linear Programming

When you try to minimize or maximize a set of multiple linear relationships within a given constraint, you use linear programming.



The area in yellow is called the feasible region, meaning it is the only set of possible values to make the relationship true for all constraints.

When you are trying to minimize or maximize something, that is the objective function. You use the vertices of the feasible region to plug into the objective function to find the min and max.

objective function
C(x) = 2x + y

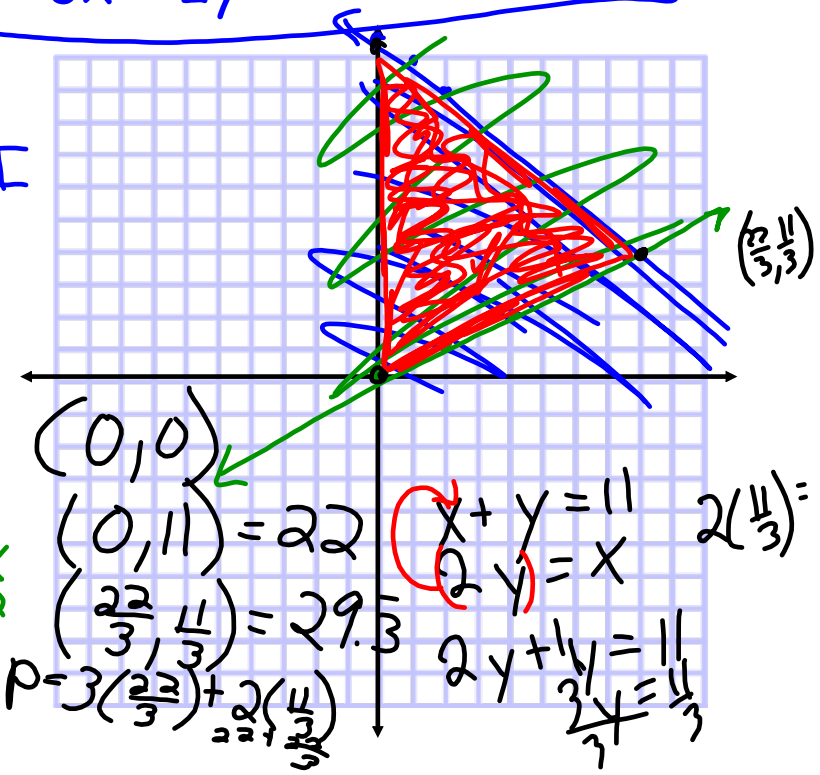
vertices
(2, 3) C = 2(2)+3=7
(2, 6) C = 2(2)+6=10
(4, 6) C = 2(4)+6=14
(7, 3) C = 2(7)+3=17

Find the min and max for the function above.

#19.

$$\begin{cases} x + y \le 11 \\ 2y \ge x \\ x \ge 0, y \ge 0 \end{cases}$$ QI

Find the Maximum for
P=3x + 2y



$x + y \le 11$
$-x \quad -x$
$y \le -x + 11$

$\frac{1}{2}y \ge \frac{x}{2}$ $y \ge \frac{1}{2}x$

Use Linear Programming to Maximize Profit

You want to make t-shirts. You have at most 20 hours to make them. You only have up to $600 to spend on supplies. You want to have at least 50 to sell.

1 color	3 color
10 mins to make	30 mins to make
supplies cost $4	supplies cost $20
Profit: $6	Profit: $20

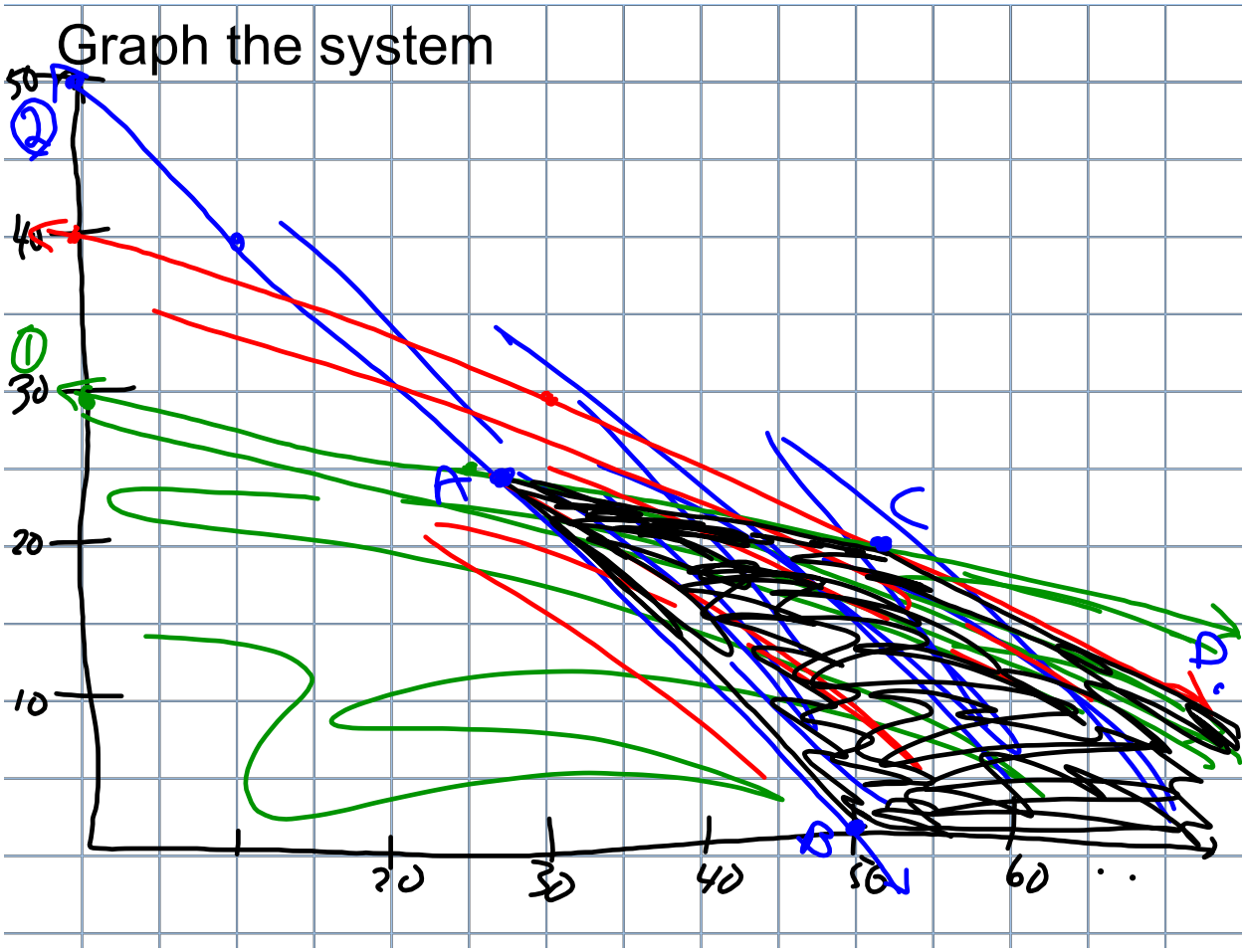
Write the system:

$$\begin{cases} 4x + 20y \leq 600 \\ x + y \geq 50 \\ 10x + 30y \leq 1200 \end{cases} \Rightarrow (\text{20 hrs into mins})$$

Objective function:

$$P = 6x + 20y$$

Graph the system



Find the vertices and plug into objective function.

$P = 6x + 20y$

$(25,25) = 6(25) + 20(25) = \$650$

$(50,0) = \$300$

$(75,15) = \$750$ 75 1 color 15 3 color

$(120,0) = 6(120) + 20(0) = \$720$

Hwk:

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#10, 12, 15, 16, 18, 20, 25, 26, 36