b.) Draw a graph of the feasible region.

Profit = \$500x + \$200y

c.) You can make a profit of \$500 for each Thoroughbred and \$200 for each Quarter horse. What is the maximum feasible profit you can make per year?

x y

P_1 (0, 15) → 500(0) + 200(15) = \$3000

P_2 (0, 12) → 500(0) + 200(12) = \$2400

P_3 (9, 3) → 500(9) + 200(3) = \$5100

P_4 (7, 14) → 500(7) + 200(14) = \$6500 ← biggest profit

P_5 (3, 15) → 500(3) + 200(15) = \$4500

Solution: Maximum Profit would be \$6,500 with 7 Thoroughbreds and 14 Quarter Horses

Extended Practice:

1. Joe P. is the president of Joe's Corn Chips Inc. His company is divided into two departments which put out two kinds of corn chips, Extra Larges and Really Smalls. Each department has separate regulations concerning the number of bags produced per day.

a.) Write an inequality for each of the following.

i. No more than 20 kilobags of Extra Larges and no more than 30 kilobags of Really Smalls can be put out per day.
Let x = number of kilobags of Extra Larges
y = number of kilobags of Really Smalls

$x \le 20$ $y \le 30$

ii. No more than 45 kilobags, total, can be manufactured each day.

$x + y \le 45$

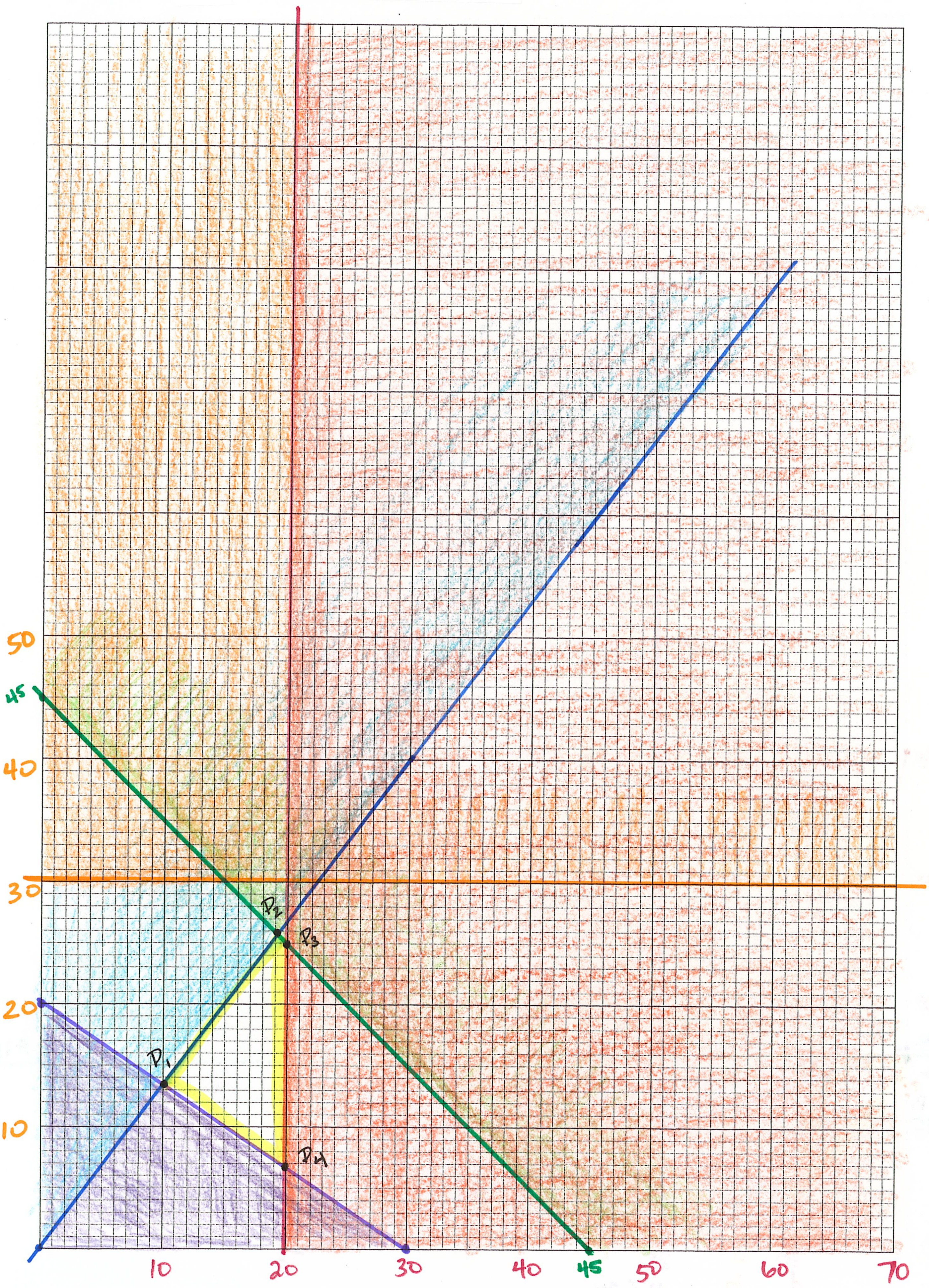
iii. The number of Extra Larges can be no less than ¾ the number of Really Smalls produced each day.

$x \ge \frac{3}{4}y$

iv. At least 300 hours of labor must be used each day to meet union requirements. It takes 10 hours to make a kilobag of Extra Larges and 15 hours to make a kilobag of Really Smalls.

$10x + 15y \ge 300$

Extended Practice : Corn Chips



b.) Graph the feasible region.

c.) Joe's Corn Chip company makes a profit of $200 per kilobag of Extra Larges and a profit of $150 per kilobag of Really Smalls. Write an equation expressing profit in terms of the two kinds of chips.

$$\text{Profit} = 200x + 150y$$

$P_1\ (10, 13) \rightarrow 200(10) + 150(13) = \$3,950$

$P_2\ (19, 26) \rightarrow 200(19) + 150(26) = \$7,700$

$P_3\ (20, 25) \rightarrow 200(20) + 150(25) = \$7,750$

$P_4\ (20, 7) \rightarrow 200(20) + 150(7) = \$5,050$

d.) How many bags of each kind of chips should be produced each day to give the greatest feasible profit? What is the profit?

Maximum Profit = $7,750

20 Kilobags of Extra Large

25 Kilobags of Really Smalls

e.) How many bags of each kind of chips should be produced each day to give the least feasible profit? What is the profit?

Minimum Profit = $3,950

10 Kilobags of Extra Larges

13 Kilobags of Really Smalls

Break for Practice:

2. Suppose that you are chief mathematician for the Government's million-dollar Vitamin Research project. Your scientists have been studying the combined effects of vitamins A and B on the human system.

a.) Write an equation expressing d in terms of x (vitamin A) and y (vitamin B) if vitamin A costs 0.06 cents per unit (not $0.06), and vitamin B costs 0.05 cents per unit. Write the equation expressing this.

$$d = 0.06x + 0.05y$$

b.) Write inequalities to represent the following requirements.

i. The body can tolerate no more than 600 units per day of vitamin A, and no more than 500 units of vitamin B.

Shade below $x \leq 600$ $\boxed{\text{opposite: above}}$ Solid line (vertical)

Shade below $y \leq 500$ $\boxed{\text{opposite: above}}$ Solid line (horizontal)

ii. The total number of units per day of the two vitamins must be between 400 and 1000, inclusive.

$x + y \geq 400$ (−x, −x) $b = 400$ $m = \frac{-1}{1}$

Shade above $y \geq -x + 400$ $\boxed{\text{opposite: below}}$ Solid line

$x + y \leq 1000$ (−x, −x) $b = 1000$ $m = -\frac{1}{1}$

Shade below $y \leq -x + 1000$ $\boxed{\text{opposite: above}}$ Solid line

iii. Due to the combined effects of the two vitamins, the number of units per day of vitamin B must be more than ½ the number of units per day of vitamin A, but less than or equal to three times the number of units per day of vitamin A.

Shade above $y \geq \frac{1}{2}x$ $\boxed{\text{opposite: below}}$ Solid line $b = 0$ $m = \frac{1}{2}$

Shade below $y \leq 3x$ $\boxed{\text{opposite: above}}$ Solid line $b = 0$ $m = \frac{3}{1}$

c.) Graph the feasible region.

d.) Which point in the feasible region represents the minimum cost, optimum point? What is this minimum cost?

P_1 (100, 300) → 0.06(100) + 0.05(300) = $21

P_2 (170, 500) → 0.06 (170) + 0.05 (500) = $35.20

P_3 (500, 500) → 0.06 (500) + 0.05 (500) = $55

P_4 (600, 400) → 0.06 (600) + 0.05 (400) = $56

P_5 (600, 300) → 0.06 (600) + 0.05 (300) = $51

P_6 (170, 130) → 0.06(170) + 0.05 (130) = $16.70

Minimum Cost is $16.70 for 170 units of Vitamin A and 130 units of Vitamin B

Extended Practice:

2. The student council decides to raise funds by selling imported clothing. Let x be the number of shirts and y be the number of dresses imported. The import order must follow these parameters.

a.) Write an inequality for each of the following parameters.

i. The total number of dresses must be at least 10.

$y \geq 10$

ii. The number of shirts must be between 5 and 27, inclusive.

$x \geq 5$ $x \leq 27$

iii. The number of dresses must be less than or equal to twice the number of shirts, but at least one-fourth the number of shirts.

$y \leq 2x$ $y \geq \frac{1}{4}x$

iv. Four times the number of shirts plus three times the number of dresses is at most 135.

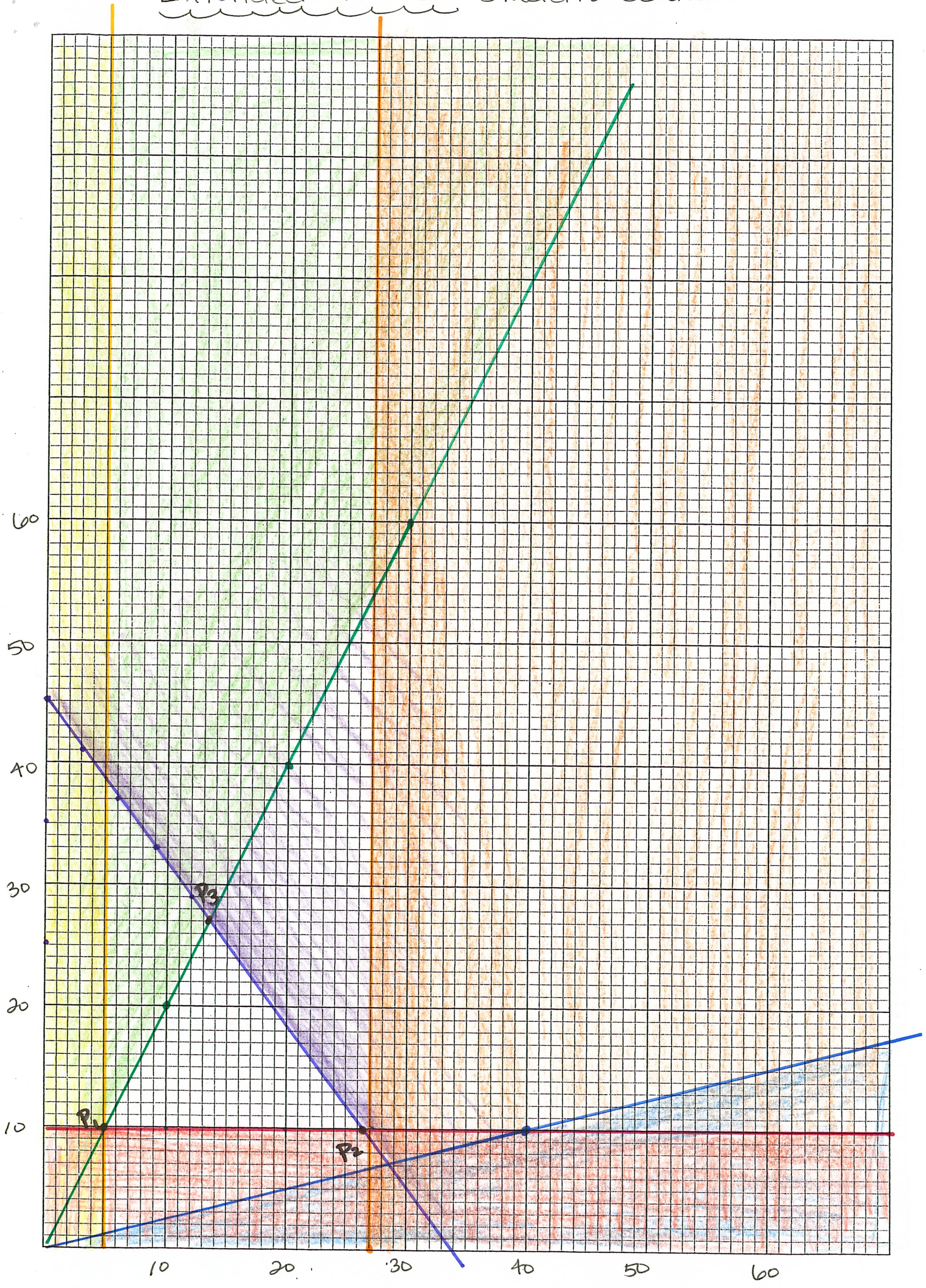
$4x + 3y \leq 135$

b.) Graph the feasible region.

c.) Shirts cost $10 each and dresses cost $20 each. Write an equation expressing the cost in terms of dresses and shirts.

Cost = \$10x + \$20y

Extended Practice: Student Council



d.) We wish to minimize the cost. Find the point and the minimal feasible cost.

P_1 (5,10) → \$10(5) + \$20(10) = \$250

P_2 (29,10) → \$10(29) + \$20(10) = \$490

P_3 (13,27) → \$10(13) + \$20(27) = \$670

Minimal Cost is \$250 with 5 shirts and 10 dresses

e.) Shirts can be sold for \$70 and dresses for \$50 each. Write an equation expressing the revenue in terms of dresses and shirts.

Profit = \$70x + \$50y

P_1 (5,10) → \$70(5) + \$50(10) = \$850

P_2 (29,10) → \$70(29) + \$50(10) = \$2,530

P_3 (13,27) → \$70(13) + \$50(27) = \$2,260

f.) We wish to maximize the revenue. Find the point and the maximum feasible revenue.

Maximium Revenue is \$2,530 with 29 shirts and 10 dresses