Name_____ Date_____

Algebra 2-1 Chapter 3 Review Part 2 (3-4 and 3-5)

Solve the following linear programming problem:

1. Maximize $P = 5x + 5y$

Subject to: $\begin{cases} 2x + y \le 10 \\ x + 2y \le 8 \\ x \ge 0 \\ y \ge 0 \end{cases}$

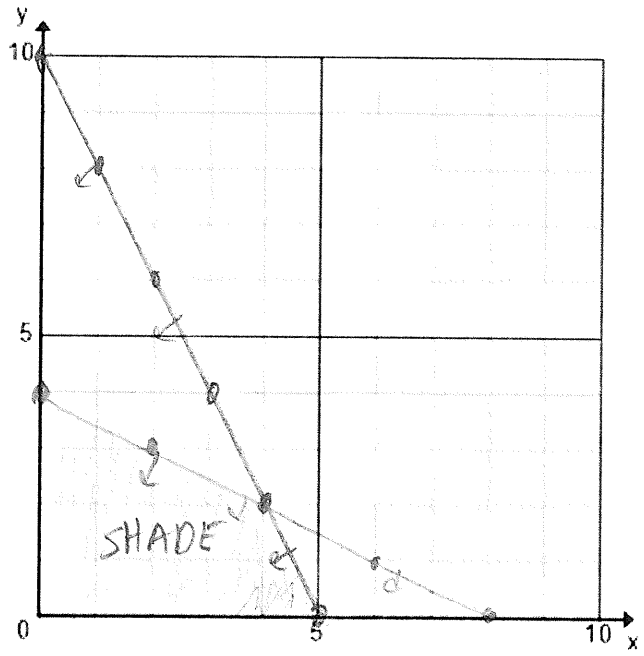
a) $2x + y \le 10$

$y \le -2x + 10$

b) $x + 2y \le 8$

$\frac{2}{2}y \le \frac{-x}{2} + \frac{8}{2}$

$y \le -\frac{1}{2}x + 4$



Corners: (0, 4), (4, 2), (5, 0)

$P = 5(0) + 5(4) = 20$

$P = 5(4) + 5(2) = 20 + 10 = 30$

$P = 5(5) + 5(0) = 25$

2. A manufacturing company makes two type of water skis, a trick ski and a slalom ski. It takes 6 hours of labor to fabricate a pair of trick skis and 4 hours for a pair of slalom skis. After fabricating the skis, it then takes 1 hour to finish a pair of trick skis and 1 hour to finish a pair of slalom skis. There are 108 labor hours available per day for fabricating skis and 24 labor hours available for finishing them.

Department	Labor Hours Per Ski		Maximum Labor-Hours Available Per Day
	Trick Ski	Slalom Ski	
Fabricating	$6x$ +	$4y$	≤ 108
Finishing	$1x$ +	$1y$	≤ 24
Profit	$40x$ +	30	MAXIMIZE

If the profit on a trick ski is \$40 and the profit on a slalom ski is \$30, how many of each type of ski should be manufactured each day to realize a maximum profit? What is the maximum profit? (You may use Geogebra).

a) $6x + 4y \leq 108$

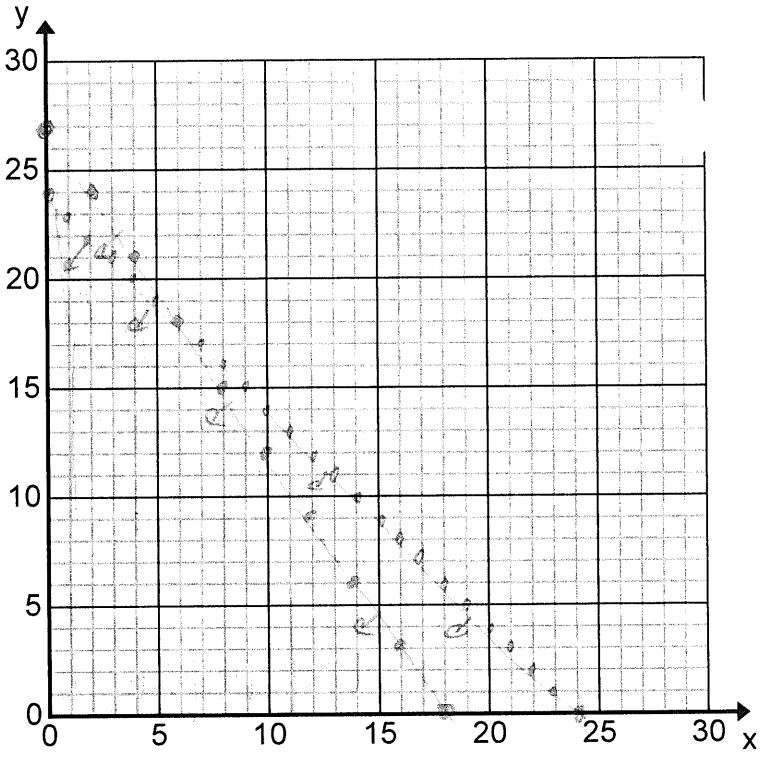
$-6x \quad -6x$

$\frac{4y}{4} \leq \frac{-6x}{4} + \frac{108}{4}$

$y \leq -\frac{3}{2}x + 27$

b) $x + y \leq 24$

$y \leq -x + 24$



Corners: $(0,24), (6,18), (18,0)$

$P = 40(0) + 30(24) = 720$

$P = 40(6) + 30(18) = 780$

$P = 40(18) + 30(0) = 720$

Max: 6 Trick skis and 18 slalom skis for \$780 profit

* Since there are no y's in equation 3, eliminate y.

4. Solve the following system of 3-variable equations. Use elimination.

$$\begin{cases} -2x + y - z = 2 \\ -x - 3y + z = -10 \\ 3x + 6z = -24 \end{cases} \rightarrow ①$$

$3(2x + y - z = 2)$

$-6x + 3y - 3z = 6$

$+ \quad -x - 3y + z = -10$

$-7x - 2z = -4$

(2) $3x + 6z = -24$

$3(-7x - 2z = -4)$

$3x + 6z = -24$

$+ \quad -21x - 6z = -12$

$-18x = -36$

$-18 \quad -18$

$x = 2$

(3) $3(2) + 6z = -24$

$6 + 6z = -24$

$-6 \quad -6$

$6z = -30$

$6 \quad 6$

$z = -5$

(4) $-(2) - 3y - 5 = 10$

$-2 - 3y - 5 = 10$

$-3y - 7 = 10$

$+7 \quad +7$

$-3y = 3$

$y = 1$

$(2, 1, -5)$

5. Solve the following system of 3-variable equations. Use substitution.

$$\begin{cases} 13 = 3x - y \\ 4y - 3x + 2z = -3 \\ z = 2x - 4y \end{cases} \rightarrow ① \; 4y - 3x + 2(2x - 4y) = -3$$

$4y - 3x + 4x - 8y = -3$

$x - 4y = -3$

(2) $-3(x - 4y = -3)$

$3x - y = 13$

$-3x + 12y = 9$

$+ \quad 3x - y = 13$

$11y = 22$

$11 \quad 11$

$y = 2$

(3) $x - 4(2) = -3$

$x - 8 = -3$

$+8 \quad +8$

$x = 3$

(4) $z = 2(3) - 4(2)$

$z = 6 - 8$

$z = -2$

$(3, 2, -2)$

6. **Business** You manage a clothing store and budget \$6000 to restock 200 shirts. You can buy T-shirts for \$12 each, polo shirts for \$24 each, and rugby shirts for \$36 each. If you want to have twice as many rugby shirts as polo shirts, how many of each type of shirt should you buy? Write a 3-variable system and solve.

$6000 = 12x + 24y + 36z$

$200 = x + y + z$

$z = 2y$

x = # of t-shirts

y = # of polo shirts

z = # of rugby shirts

(1) $6000 = 12x + 24y + 36(2y)$

$6000 = 12x + 24y + 72y$

$6000 = 12x + 96y$

(2) $200 = x + y + 2y$

$200 = x + 3y$

(3)

$6000 = 12x + 96y$

$-12(200 = x + 3y)$

$-2400 = -12x - 36y$

$+ \quad 6000 = 12x + 96y$

$3600 = 60y$

$60 = y$

(4) $200 = x + 3(60)$

$200 = x + 180$

$20 = x$

(5) $200 = 20 + 60 + z$

$120 = z$

20 t-shirts

60 Polos

120 rugby shirts