Review 3A

1. Graph the solution set to $\begin{cases} x + 2y \leq 20 \\ 3x + y \leq 24 \\ x \geq 0,\ y \geq 0 \end{cases}$.

2. Formulate as a linear programing problem: The office manager of a large accounting firm needs at least 315 more boxes of pens and 120 more boxes of pencils but has only \$1500 left in the budget. Jack's Office Supplies has packages of 5 boxes of pens with 2 boxes of pencils on sale for \$20, while Jan's Discount offers packages of 3 boxes of pens and 1 box of pencils for \$11. How many packages from each store should be bought to restock the store room at the least cost?

3. Solve using the method of corners.

$$\begin{aligned} \text{Maximize} \quad & P = 3x - 4y \\ \text{subject to} \quad & x + y \leq 4 \\ & y - x \leq 2 \\ & y - x \geq -2 \\ & x \geq 0,\ y \geq 0 \end{aligned}$$

4. Solve using the Simplex method.

$$\begin{aligned} \text{Maximize} \quad & P = x + 2y \\ \text{subject to} \quad & 3x + y \leq 24 \\ & x + y \leq 14 \\ & x \geq 0,\ y \geq 0 \end{aligned}$$

5. Solve by constructing the dual problem.

$$\begin{aligned} \text{Minimize} \quad & C = 60x + 100y + 300z \\ \text{subject to} \quad & x + 2y + 3z \geq 180 \\ & 4x + 5y + 6z \geq 120 \\ & x \geq 0,\ y \geq 0,\ z \geq 0 \end{aligned}$$

This and all other class documents can be found on the web at: http://www.geocities.com/pvachusk/

Answers (Not Solutions) to the problems on the other side: **1.** in class; **2.** Maximize $P = 20x + 30y$ subject to $x + y \leq 100,000$, $.01x + .02y \leq 1400$ and $x \geq 0$, $y \geq 0$; **3.** $(4, 0)$ produces a maximum of $P = 12$; **4.** $x = 0$, $y = \frac{15}{2}$, $z = 0$ produces a maximum of $P = \frac{135}{2}$; **5.** Maximize $P = 42u + 21v$ subject to $2u + 3v \leq 7$, $3u + v \leq 7$ and $u \geq 0$, $v \geq 0$. $x = 3$, $y = 12$ produces a minimum of $C = 105$.

Review 3B

1. Graph the solution set to $\begin{cases} 2x + 3y \geq 24 \\ 3x + \ y \geq 10 \\ x \geq 0,\ y \geq 0 \end{cases}$.

2. Formulate as a linear programing problem: An empty storage yard at a coal-burning electric powor plant can hold no more than 100,000 tons of coal. Two grades of coal are available: low sulfur (1%) with an energy content of 20 million British thermal units (BTU) per ton and high-sulfur (2%) with an energy content of 30 million BTU per ton. If the next coal purchase may contain no more than 1400 tons of sulfur, how many tons of each type of coal should be purchased to obtain the most energy?

3. Solve using the method of corners.

$$\begin{aligned} \text{Maximize} \quad & P = 3x + 2y \\ \text{subject to} \quad & y - \ x \leq \ 1 \\ & 3x + 4y \leq 12 \\ & x \geq 0,\ y \geq 0 \end{aligned}$$

4. Solve using the Simplex method.

$$\begin{aligned} \text{Maximize} \quad & P = 8x + 9y + 7z \\ \text{subject to} \quad & 3x + \ y + 4z \leq 12 \\ & 6x + 2y + 5z \leq 15 \\ & x \geq 0,\ y \geq 0,\ z \geq 0 \end{aligned}$$

5. Solve by constructing the dual problem.

$$\begin{aligned} \text{Minimize} \quad & C = 7x + 7y \\ \text{subject to} \quad & 2x + 3y \geq 42 \\ & 3x + \ y \geq 21 \\ & x \geq 0,\ y \geq 0 \end{aligned}$$

Answers (Not Solutions) to the problems on the other side: **1.** in class; **2.** Minimize $C = 20x+11y$ subject to $5x+3y \geq 315$, $2x+y \geq 120$, $20x+11y \leq 1500$ and $x \geq 0$, $y \geq 0$; **3.** $(2, 0)$ produces a maximum of $P = 6$; **4.** $x = 0$, $y = 14$ produces a maximum of $P = 28$; **5.** Maximize $P = 180u + 120v$ subject to $u + 4v \leq 60$, $2u + 5v \leq 100$, $3u + 6v \leq 300$ and $u \geq 0$, $v \geq 0$. $x = 0$, $y = 90$, $z = 0$ produces a minimum of $C = 9000$.