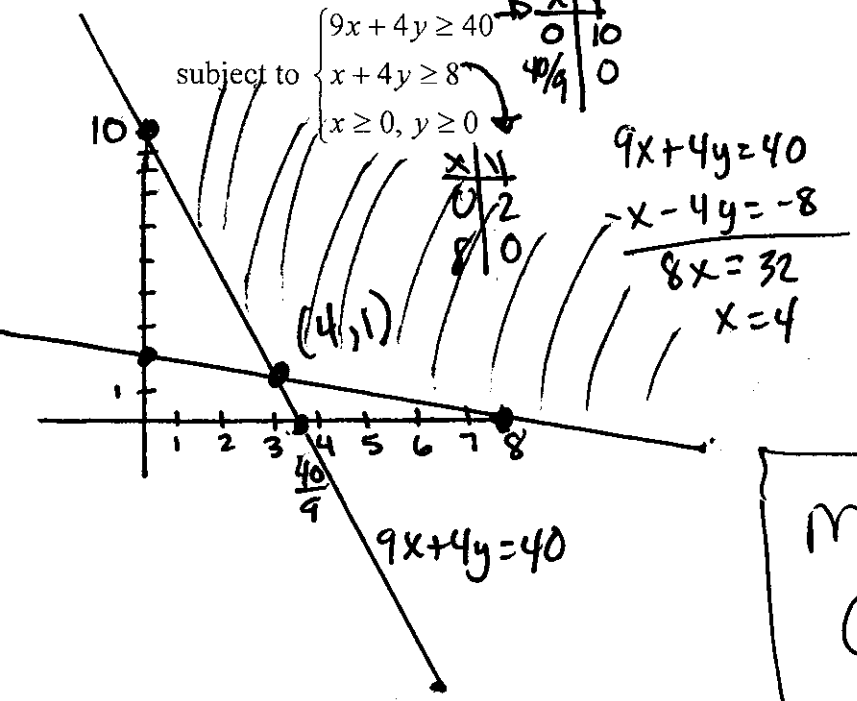
Finite Mathematics Quiz #1
Friday, January 25, 2008

Name Key

Show all your work on this paper. Solutions without correct supporting work will not be accepted.

1. Minimize $C = 2x + 3y$ (9 points)

subject to $\begin{cases} 9x + 4y \geq 40 \\ x + 4y \geq 8 \\ x \geq 0,\ y \geq 0 \end{cases}$



x	y
0	10
40/9	0

x	y
0	2
8	0

$9x+4y=40$
$-x-4y=-8$
$8x=32$
$x=4$

Corner Points

Objective Function

$C = 2x+3y$

$(0,10) \rightarrow C = 2(0)+3(10) = 30$

$(4,1) \rightarrow C = 8+3 = 11$

$(8,0) \rightarrow C = 16+0 = 16$

Minimum value is 11 @ (4,1)

2. Set up the following problem ***but do not solve***.

A road-paving firm has on hand three types of paving material. Each barrel of type A contains 2 gallons of carbon black and 2 gallons of thinning agent and costs \$5. Each barrel of type B contains 3 gallons of carbon black and 1 gallon of thinning agent and costs \$3. Each barrel of type C contains 3 gallons of carbon black and 1 gallon of thinning agent and costs \$4. The firm needs to fill an order for which the final mixture must contain at least 12 gallons of carbon black and at least 6 gallons of thinning agent. How many barrels of each type of paving material should be used to fill this order at minimum expense? (7 points)

Objective: minimize Expense

$E = 5x+3y+4z$ Minimize

x = # of barrels of type A
y = # of barrels of type B
z = # of barrels of type C

Subject to:

$$\begin{cases} 2x+3y+3z \geq 12 \\ 2x+y+z \geq 6 \\ x \geq 0,\ y \geq 0,\ z \geq 0 \end{cases}$$

LOOK ON THE BACK

3. Solve the following system of equations using Gauss-Jordan elimination. List the row operations used at each step (For example: $-3R_1 + R_2$) You may use ROWOPS or MATRXOPS. (9 points)

$$\begin{cases} x-2y+3z=9 \\ -x+3y=-4 \\ 2x-5y+5z=17 \end{cases} \qquad \left(\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ -1 & 3 & 0 & -4 \\ 2 & -5 & 5 & 17 \end{array}\right)$$

$R_1+R_2 \to R_2$, $-2R_1+R_3 \to R_3$

$$\left(\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & -1 & -1 & -1 \end{array}\right)$$

$2R_2+R_1 \to R_1$, $R_2+R_3 \to R_3$

$$\left(\begin{array}{ccc|c} 1 & 0 & 9 & 19 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 2 & 4 \end{array}\right) \qquad \frac{1}{2}R_3 \to R_3$$

$$\left(\begin{array}{ccc|c} 1 & 0 & 9 & 19 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 1 & 2 \end{array}\right)$$

$-3R_3+R_2 \to R_2$, $-9R_3+R_1 \to R_1$

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{array}\right)$$

Solution: $(1, -1, 2)$