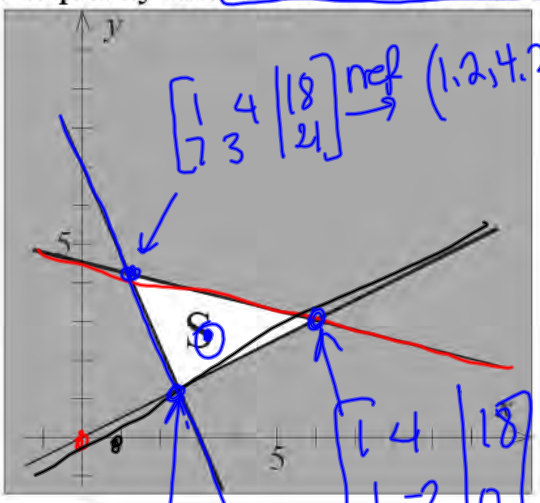
Exam 2 Review Questions

LINEAR PROGRAMMING

1. The graph below shows the feasible region in white. Circle the correct inequality and find the exact values of all corner points.



$x + 4y \leq 18$ $\geq$

$7x + 3y \leq 21$ $\geq$

$x - 2y \leq 0$ $\geq$

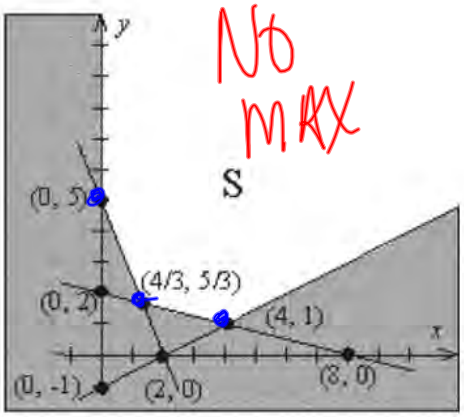
$\begin{bmatrix} 1 & 4 & 18 \\ 7 & 3 & 21 \end{bmatrix}$ ref $\rightarrow$ (1.2, 4.2)

$\begin{bmatrix} 1 & 4 & 18 \\ 1 & -2 & 0 \end{bmatrix}$ ref $\rightarrow$ (6, 3)

$\begin{bmatrix} 1 & -2 & 0 \\ 7 & 3 & 21 \end{bmatrix}$ ref $\rightarrow$ $\left(\frac{42}{17}, \frac{21}{17}\right)$

(3,3) is true for everyone

2. What are the maximum and minimum values of $f(x, y) = 3x + 4y$, if any, on the region shown to the right?



No MAX

vertex	$f = 3x + 4y$
(0,5)	20
(4/3, 5/3)	10 2/3 $\rightarrow$ min
(4,1)	16

3. A diet planner is trying to determine how much chicken and potatoes can be used in a packaged dinner. The nutritional requirements produce a feasible region that is unbounded with corners at (0, 40), (5, 20), (10, 10) and (30, 0). If x is the number of ounces of chicken and y is the number of ounces of potatoes, then the calories in the meal is given by

$$C = 42x + 21y.$$

Determine how much chicken and potato should be used in a meal to meet the nutritional requirements with a minimum number of calories.

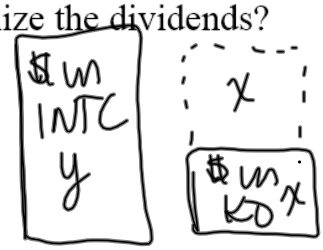
Vertex	$C = 42x + 21y$
(0, 40)	840
(5, 20)	630 } min
(10, 10)	630
(30, 0)	1260

Run on $630 = 42x + 21y$
for $5 \le x \le 10$
$y = 30 - 2x$

Use $5 \le x \le 10$ oz of chicken and $y = 30 - 2x$ oz of potatoes for a total of 630 calories

4. Set up the following Linear Programming Problem. *DO NOT SOLVE*. Mazie has at most \$12000 to invest in three different stocks. The KO company costs \$42.00 per share and pays dividends of \$1.25 per share. The INTC company costs \$21.00 per share and pays dividends of \$0.40 per share. The MCD company costs \$35.00 per share and pays \$0.67 per share in dividends. Mazie has given her broker the following instructions: Invest at least twice as much money in INTC as in KO. Also, no more than 25% of the total invested should be in MCD. How should Mazie invest her money to maximize the dividends?

x = \$ in KO
y = \$ in INTC
z = \$ in MCD
D = div in \$



$$\text{Max } D = 1.25\left(\frac{x}{42}\right) + .4\left(\frac{y}{21}\right) + .67\left(\frac{z}{35}\right)$$

SUB. TO

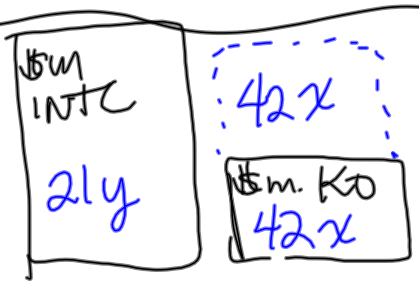
$x + y + z \le 12000$ (total \$)

$y \ge 2x$ (ratio INTC & KO)

$z \le .25(x + y + z)$ limit on MCD

$x, y, z \ge 0$

x = # of sh of KO
y = # of sh of INTC
z = # of sh of MCD
D = div in \$



$$\text{Max } D = 1.25x + .4y + .67z$$

SUB TO

$42x + 21y + 35z \le 12000$ (total \$)

$21y \ge 2(42x)$ (ratio INTC and KO)

$35z \le .25(42x + 21y + 35z)$ (limit on MCD)

$x, y, z \ge 0$

5. Every day a baker has 44 units of flour, 26 units of sugar and 100 units of raisins. A loaf of raisin bread requires 2 units of flour, 1 unit of sugar and 2 units of raisins. A raisin cake requires 1 unit of flour, 1 unit of sugar and 5 units of raisins.

(a) Raisin bread sells for $2 per loaf and raisin cakes sell for $5 each. How many of each item should be made to maximize revenue? What is the maximum revenue? Is anything leftover? Fractional items are not allowed?

(b) If the price of raisin breads is increased to $3 per loaf, how many of each item should be made? What is the revenue?

(c) What range of prices are possible for the raisin cakes so that the solution remains at the point above?

(d) What is the range in value for the raisins ordered per day? What is the shadow price for raisins?

x = # of R.B.
y = # of R.C.
R = rev. in $

Max $R = 2x + 5y$

S.T.

$2x + y \leq 44$ (flour)
$1x + 1y \leq 26$ (sugar)
$2x + 5y \leq 100$ (raisins)
$x \geq 0,\ y \geq 0$