

(10pts) NAME (printed neatly): \_\_\_\_\_

(5pts) Section Number (circle correct section): 503 (10:20am) 521 (11:30am) 523 (1:50pm)

Quiz Grade: \_\_\_\_\_

1. (8pts) The matrix  $\left[ \begin{array}{ccc|c} 1 & -2 & 0 & 3 \\ 0 & 0 & 1 & -4 \\ 0 & 0 & 0 & 0 \end{array} \right]$  represents a system of equations. Give two particular solutions to this system of equations.

Since  $x = 2y + 3$  and  $z = -4$ , the solutions are of the form  $(2t + 3, t, -4)$  where  $t$  is any real number.

Some particular solutions are  $(3, 0, -4)$ ,  $(5, 1, -4)$ ,  $(7, 2, -4)$ , and  $(1, -1, -4)$ .

2. An emu requires 18 pounds of grass food and 32 labor hours to grow to maturity. An alpaca requires 25 pounds of grass food and 25 labor hours to grow to maturity. Since the rancher already has an order for 100 alpacas, at least 100 will need to be raised. Due to limited land devoted to emus, no more than 400 emus will be raised. There are only 12,500 pounds of grass food and 16,000 labor hours available to raise these critters. If adult emus sell for \$800 each and adult alpacas sell for \$600 each, how many of each should be raised to maximize revenue?

a. (4pts) Define your variables  $x$  and  $y$ , where  $x$  is related to emus.

$x$  = number of emus  
 $y$  = number of alpacas

b. (18pts) Set up the linear programming problem.

Maximize  $R = 800x + 600y$

Constraints:

$18x + 25y \leq 12500$  pounds of grass food

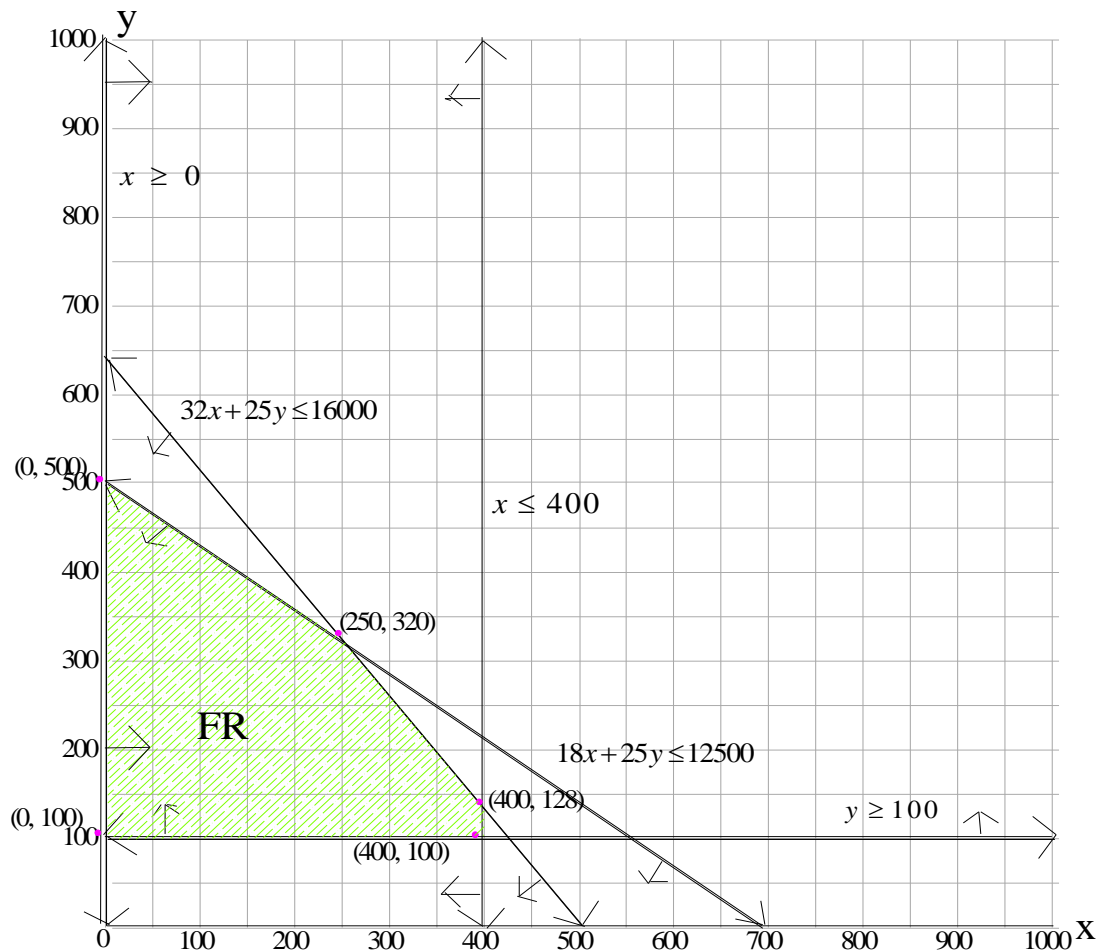
$32x + 25y \leq 16000$  labor hours

$y \geq 100$

$x \leq 400$

$x \geq 0$  [do not need  $y \geq 0$  since  $y \geq 100$ ]

c. (22pts) Graph the constraints, label the lines, label the corner points of the feasible region, and label the feasible region **FR**.



d. (15pts) Show your work to solve this linear programming problem.

Corner	$R = 800x + 600y$
$(0, 100)$	60000
$(0, 500)$	300,000
$(250, 320)$	392,000
$(400, 128)$	396,800 max
$(400, 100)$	380,000

e. (12pts) Write a sentence that gives the solution to this linear programming problem by including all critical information.

A maximum revenue of \$396,800 is obtained when 400 emus and 128 alpacas are raised and sold.

f. (6pts) Discuss leftovers.

$$18x + 25y \leq 12500 \quad \text{pounds of grass food}$$

$$18(400) + 25(128) = 10400$$

$$12500 - 10400 = 2100$$

There are 2100 pounds of grass food leftover.

$$32x + 25y \leq 16000 \quad \text{labor hours}$$

$$32(400) + 25(128) = 16000$$

$$16000 - 16000 = 0$$

There are no labor hours leftover; that is, all the labor hours are used.