Name: _____ Date: _____

Math 110

/100

Exam 2 – Exponential Functions and Linear Programming

Show all work for full credit!!!

1. **(10 pts)** The graph below shows the feasible region for the production of two different kinds of tents, the standard tent and the expedition tent. The x-axis represents the standard tent and the y-axis represents the y-axis. If the company makes a profit of $50 on each standard tent and $80 on each expedition tent, how many tents of each type should be manufactured each day to maximize the total daily profit?

   a. What are the vertices of the feasible region?

   b. Write an objective function.

   c. Evaluate the vertices in the objective function.

   d. How many tents of each type should be manufactured each day to maximize the total daily profit? What is the maximum profit? Write your answer in a full sentence.

2. **(15 pts)** In college, we study large volumes of information— information that, unfortunately, we do not often retain for very long. The function $f(x) = 80e^{-0.5x} + 20$ describes the percentage of information, $f(x)$, that a particular person remembers, x weeks after learning the information.
    a. Graph this equation by identifying and labeling the horizontal asymptote, x-intercept, and y-intercept.

    b. What percentage of the information do you recall 4 weeks after learning the information? . Round answer to two decimal places.

    c. Interpret the meaning of the horizontal asymptote.

    d. After how many weeks will you remember only half of the information you learned? . Round final answer to two decimal places.

3. **(15 pts)** Graph and shade the feasible region and label vertices. Find the minimum and maximum of the objective function subject to the given constraints.

Objective function: $C = 4x - 5y$

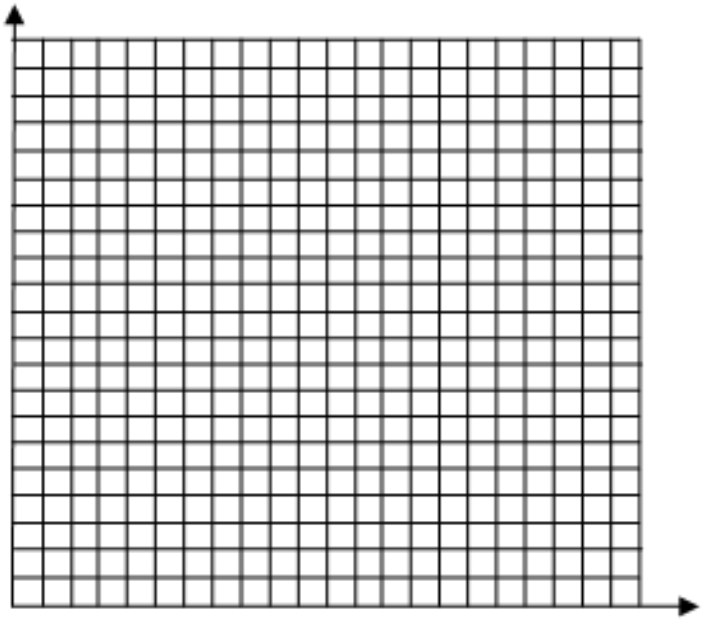
Constraints:

$x \geq 0$

$y \geq 0$

$2x + 3y \leq 12$

$x + 3y \leq 9$



Vertices:

Evaluate objective function:

Minimum: _____ at (,)

Maximum: _____ at (,)

4. **(15 pts)** You have $2000 to invest in an account.
    a. You can put the money in an account with 2.5% interest compounded quarterly. How much money will you have after 5 years? Round answer to two decimal places.

    b. How much interest was earned?

    c. You can put the money in an account with 2.5% interest compounded continuously. How much money will you have after 5 years? Round answer to two decimal places.

    d. How much interest was earned?

    e. Which account has more money after 5 years? How much more does it have?

5. **(5 pts)** If you want to have $2000 in 5 years, how much money must you deposit today in an account that earns 2.24% interest compounded continuously? . Round final answer to two decimal places.

6. **(18 pts)** In 2012, Southwest Airlines carried 109 million passengers. The number of passengers grew at an annual rate of 7.42%.
    a. Write an exponential model for the number of Southwest Airlines passengers, in millions, *t* years after 2012

    b. How many passengers can they expect in the year 2025? Round to the nearest whole number.

    c. In what year did Southwest Airlines carry 175 million passengers? Round final answer to two decimal places.

    d. Graph the equation by identifying and labeling the horizontal asymptote, x-intercept, and y-intercept.

7. **(8 pts)** A clothing company makes jackets and pants. Each jacket requires 1 hour of cutting and 4 hours of sewing. Each pair of pants requires 2 hours of cutting and 2 hours of sewing. The total time per day available for cutting is 20 hours and for sewing is 32 hours. If the profit on a jacket is $14 and the profit on a pair of pants is $8, determine the number of each that should be made each day to maximize profit.

   a. Define your variables.

   b. Write an objective function.

   c. Write the constraints. You do not have to solve this problem.

8. **(5 pts)** Jennifer invests $2,000 in an account that pays 3.6% annual interest compounded monthly. How long will it take for the account to triple? Assume no other deposits are made. Round final answer to two decimal places.

9. **(4 pts)** For a recently released movie, the function $R(x) = 119.67(0.61)^x$ models the revenue earned, $R(x)$, in millions of dollars each week, x, for several weeks after its release.
    a. Is the revenue increasing or decreasing? By what percentage?

    b. How much more money, in millions of dollars, was earned in revenue for week 3 than for week 5? Round answer to two decimal places.

10. **(5 pts)** You have $5000 that you want to put into a certificate of deposit where the interest is compounded continuously. You want to have $8000 in 5 years. What interest rate will allow you to meet your goal? Answer should be written as a percent with one decimal place.