

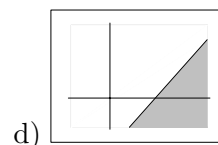
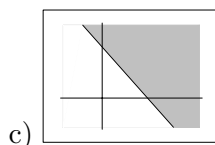
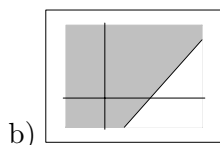
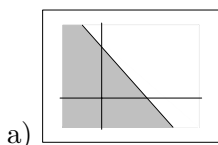
Name: \_\_\_\_\_ Section: \_\_\_\_\_ Instructor: \_\_\_\_\_

**Instructions:** This is a closed notes, closed book exam. You can not receive aid on this exam from anyone else - No sharing of calculators! If you have a question, ask your instructor. Make sure your exam has 6 pages. The last page is for scrap.

- Multiple choice questions have no partial credit. For the others, some partial credit will be given depending on the work submitted. On these questions you must show all work and calculations needed to reach your answers. Just using a calculator is not sufficient for credit.

1. (5 pts.) Which of the following graphs best fits the graph of the linear inequality

$$3x - 2y \geq 7$$

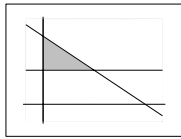


2. (8 pts.) Set up both the constraint inequalities and the profit function, **but do not solve** the linear programming optimization problem needed to find the maximum revenue.

The Beta Aerobics Company manufactures two models of steppers used for aerobic exercises. To manufacture each luxury model requires 10 lb of plastic and 10 min of labor. To manufacture each standard model requires 16 lb of plastic and 8 min of labor. The profit for each luxury model is \$40, and the profit for each standard model is \$30. If 6000 lb of plastic and 60 hr (=3600 min) of labor are available for the production of the steppers per day, how many steppers of each model should Beta produce in order to maximize profits?

**Don't forget to state clearly what the variables stand for.**

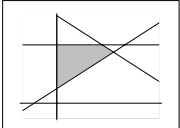
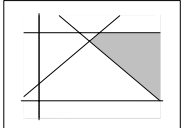
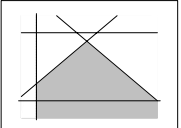
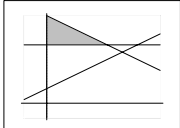
3. (5 pts.) Which of the following systems of equations corresponds to the feasible region graphed below.



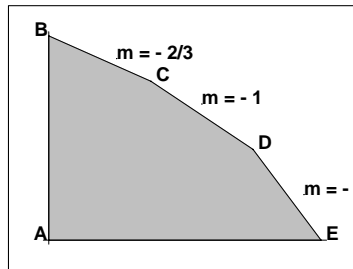
- |                      |                      |                      |                      |
|----------------------|----------------------|----------------------|----------------------|
| a) $2x - 3y \leq 12$ | b) $2x + 3y \leq 12$ | c) $2x - 3y \leq 12$ | d) $2x + 3y \leq 12$ |
| $y \leq 2$           | $y \leq 2$           | $y \geq 2$           | $y \geq 2$           |
| $x \geq 0$           | $x \geq 0$           | $x \geq 0$           | $x \geq 0$           |

4. (5 pts.) Which of the following feasible regions best describes graphically the system of linear inequalities given by:

$$\begin{aligned} 4y - 3x &\geq 4 \\ 4y + 3x &\leq 24 \\ x &\geq 0 \\ y &\leq 4 \end{aligned}$$

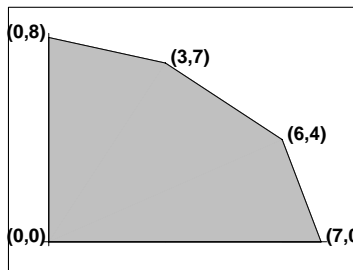
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|--|--|---|--|
| a)  | b)  | c)  | d)  |
|--|--|---|--|

5. (5 pts.) Using the feasible region to the right, find the point that maximizes the revenue function  $R = 3x + y$ .



- |      |      |      |      |
|------|------|------|------|
| a) B | b) C | c) D | d) E |
|------|------|------|------|

6. (5 pts.) Find the maximum value of the revenue function  $R = 3x + y$  given the feasible region to the right.



- |           |           |           |           |
|-----------|-----------|-----------|-----------|
| a) (0, 8) | b) (3, 7) | c) (6, 4) | d) (7, 0) |
|-----------|-----------|-----------|-----------|

7. (5 pts.) Which of the following is **True**.
- a) A feasible region may contain exactly two and no more optimal points in a linear programming problem.
  - b) All feasible regions contain an optimal point in a linear programming problem.
  - c) All bounded feasible regions which include their boundary lines contain an optimal point in a linear programming problem.
  - d) All bounded feasible regions in the first quadrant have exactly one optimal point in a linear programming problem.

**For questions 8 & 9:** Suppose that a loan of \$5,000 for 3 years is **discounted** at a simple annual interest rate of 8%.

8. (5 pts.) How much is the discount?

- a) \$1,200                      b) \$6,200                      c) \$3,800                      d) \$5,000

9. (5 pts.) How much does the recipient actually receive?

- a) \$1,200                      b) \$6,200                      c) \$3,800                      d) \$5,000

10. (5 pts.) Which of the following is **NOT True** about the effective rate of an annual rate of 7% compounded monthly for 1 year.

- a) The effective rate is more than 7%
- b) The effective rate is the equivalent simple interest rate for a 1 year period.
- c) The effective rate depends on the number of years the 7% is being applied.
- d) The effective rate is used in comparisons with other compounded interest rates.

11. (8 pts.) Kelly and Lisa need to save \$75,000 by the time little Joey goes to college 18 years from now. How much must they deposit now, if the account they use has a constant interest rate of  $3\frac{1}{4}\%$  compounded monthly, in order to have the \$75,000 at the end of the 18 years? **Show all work needed to support your answer.**

12. Suppose you win a lottery. The payoff is either \$750,000 at the end of each year for 20 years or one lump sum payment of \$10,000,000 now. For the following questions, assume a constant rate of interest of 4% compounded annually.

*i)* (6 pts.) If I were to deposit these payments of \$750,000 at the end of each year for the 20 years, how much will they grow to? **Show all work needed to support your answer.**

*ii)* (6 pts.) What will one deposit now of \$10,000,000 grow to over 20 years? **Show all work needed to support your answer.**

*iii)* (2 pts.) Based on the above calculations, which is worth more?

a) Payments of \$750,000 per year for 20 years   b) \$10,000,000 now

13. (8 pts.) Calculate the current (present day) value of an annuity that will pay you \$500 each month for the next 5 years at 6% interest compounded monthly? **Show all work needed to support your answer.**

14. (5 pts.) Suppose your monthly car payments are \$280.00 on an original car loan lasting 48 months (4 years) at an annual interest rate of  $5\frac{3}{8}\%$  compounded monthly. After 1 year (exactly), you want to sell the car. How much do you still owe on the car at that time?

- The sum of the next 36 car payments
- The amount of the original loan minus the 12 payments already made
- The present value of the remaining 36 car payments
- The sum of the 12 payments already made

15. (12 pts.) Below is the beginning of an amortization schedule for a house loan of \$130,000 at  $8\frac{1}{4}\%$  annual interest rate compounded monthly to be repaid over 15 years.

Fill in the next row of the schedule. **Show all work needed to support your answer.**

| End of Period | Repayment made | Interest charged/paid | Payment towards principal paid | Outstanding Principal |
|---------------|----------------|-----------------------|--------------------------------|-----------------------|
| 0             | —              | —                     | —                              | \$130,000.00          |
| 1             | \$1261.18      | \$893.75              | \$367.43                       | \$129,632.57          |
| 2             | \$1261.18      | \$891.22              | \$369.96                       | \$129,262.61          |
| 3             |                |                       |                                |                       |

**Scrap:** If you want any of the calculations written here to be counted as supporting work on a questions, you must make reference to it here and in the space after the appropriate question.