

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Suppose a motel owner of a motel that has 30 rooms available institutes a pricing structure that encourages rentals of rooms in groups. One room rents for \$ 85, two rent for \$ 83 each, three rooms for \$ 81 each, etc..

- (a) How much money is owed by a group consisting of a family and grandparents renting 4 rooms?

- (b) Use a formula to give the price per room if n rooms are rented as a group to a convention host.

- (c) Find a formula for the revenue $R(n)$ of the motel for renting n rooms to a single group of people.

- (d) What is the maximum amount of money the motel makes by renting to a single group?

- (e) How many rooms should be rented to a single group to maximize the motels revenue from that group?

2. The amount C of food consumed in a day by a sheep is a function of the amount V of vegetation available, and a model is

$$C = \frac{3V}{50 + V},$$

where C is measured in pounds and V in pounds per acre.

- (a) Make a graph of C versus V . Include vegetation levels up to 1000 pounds per acre.
- (b) Calculate $C(300)$ and explain in a short but precise sentence what your answer means.
- (c) Is the graph concave up or concave down? Explain in practical terms what this means.
- (d) Is there a limit to the amount of food consumed as more and more vegetation is available? If yes, what is this limit?

3. We want to form a rectangular play pen with width W in feet and length L in feet. Suppose F is the total amount of fence needed and that the area of the pen will be 144 square feet.
- (a) Write a formula for F in terms of W and L .
- (b) Express as an equation involving W and L the requirement that the total area of the pen be 144 square feet.
- (c) Solve the equation of part (b) for W .
- (d) Using parts (a) and (c), find a formula for F in terms of L alone.
- (e) Make a graph of F versus L for values of L up to 24 feet.
- (f) Determine the dimensions of the pen that require the minimum amount of fencing. Explain.

4. Use the sign table method to solve for x the inequality $\frac{x^2-9}{1-x} \leq 0$. Then graph the solution set.