

Some Word Problems

Next week there will be a chance to earn extra credit for the exam. Groups of three can choose one of the numbered problems below and present its solution to the class. Each group can earn up to 4% extra credit for the next exam where each earned point comes from the criteria following:

- Mastery of the problem: Do you understand the problem? All of the steps in solving the problem? Could you solve a related but slightly different question?
 - Presentation of the problem: You are presenting material to your classmates that will be on their exam next week. Your peers need this time to be *taught* the material (not merely shown a solution). Be sure to *explain* your steps and *why* you take them. Multiple approaches or those using materials from outside the course are encouraged!
 - Presentation: Do you interact with your audience or do you just stare at the board? Is it clear that all the members made significant contributions to the solution (consider citing each other!)? Did the group act supportive of each other?
 - Fielding questions: Can you understand someone's question about the material and formulate a cohesive answer?
1. A projectile is fired from the origin over horizontal ground. Its height y (in feet) is a function of its horizontal distance x (in feet) and is: $y = 64x - 2x^2$. Find the inverse function and describe its meaning.
 2. The revenue from selling pokemon is a quartic function R , of its price. One week the revenue is \$3025 when the pokemon were priced at \$8. The revenue was again \$3025 when the price was \$12 and again at \$14 and \$18. The revenue dropped to \$2100 when the price was \$6.
 - (a) Find an equation for the revenue as a function of price.
 - (b) Find the price that would maximize revenue. Justify your answer.
 3. The profit earned in running a bus service is jointly proportional to the distance and the difference between the number of passengers and a certain fixed number. The profit is \$80 when 30 passengers are carried a distance of 40km and is \$180 when 35 passengers are carried 60km. Find a function that describes the profit as a function of number of passengers.
 4. Alisha went to Europe last summer. They discovered that when they exchanged their U.S. dollars for euros, they received 25% fewer euros than the number of dollars they exchanged. When they returned to the United states, they got 25% more dollars than the number of euros they exchanged.
 - (a) Write each conversion function
 - (b) Are the two functions inverses?

5. A farm hires migrant workers to pick fruit. There are 12 employees and each can pick 375 oranges per hour. It is found that if more workers are added the production per worker decreases due to lack of supervision. With each additional worker added x (above 12), each worker picks $400 - x^2$ oranges per hour. Find a function for the number of oranges picked per hour.
6. The Athenians when suffering from the great plague of eruptive typhoid fever in 430BC consulted the oracle at Delos as to how they could stop it. Apollo replied that they must *double the size* of his alter which was in the form of a *cube*. The Athenians constructed a new alter where the *edges* were double that of the old. Apollo made the pestilence worse than before.
 - By what factor did the Athenians increase the size of Apollo's alter?
 - Give new directions for the construction of Apollo's alter to guarantee Apollo's request that the new alter is twice the volume of his first.
7. The normal radius of the windpipe of a human adult is approximately 1cm. When you cough, your windpipe contracts to a radius of r . The velocity at which the air is expelled varies directly with the square of r and with the difference between the normal radius and r .
 - (a) Write the formula for velocity.
 - (b) What is the domain of velocity?
 - (c) Sketch the graph of velocity.
8. It costs a shoe company on average \$28.50 to produce a shoe. The designing fees for a shoe run about \$20,000. The first 5000 shoes are given to stores for displays and celebrities to wear.
 - (a) Write a function f describing the average cost of a shoe.
 - (b) How many shoes need to be made to bring the average cost of a shoe under \$40?
 - (c) Identify the vertical asymptote and explain its meaning.
9. Find a point on the parabola $y = x^2$ whose distance from (18,0) is $4\sqrt{17}$. (use technology!)
10. Police estimate that the speed of a car in miles per hour varied directly as the square root of d , where d in feet is the length of the skid marks left by a car traveling on a dry concrete pavement. A car traveling 48 miles per hour leaves skid marks of 96 feet.
 - (a) Write an equation relating speed and d .
 - (b) Suppose you are driving 65 miles per hour and slam on your brakes. How long will your skid marks be?