

Math 220 - Calculus f. Business and Management - Worksheets 21 & 22

Worksheets 21, 22 - Related Rates

This worksheet contains six related rates problems. To solve such a problem you must perform the following two tasks:

Task 1: Read each problem, identify the known and desired rates and quantities. Draw a picture if necessary and write the appropriate equation.

Task 2: Take the derivative of both sides of the equation with respect to time. Solve the new equation for the desired rate.

You can perform the first task for all problems you intend to solve and then perform the second task or you can completely solve a problem and then move on to the next one. Each approach has its advantages: The first one is good if focusing on a single task until it “sticks” works well for you, the second one is good if you need the instant gratification of having the result for a problem to keep on working the problems.

Exercise 1: In this problem the equation is supplied so it is only necessary to identify the known and desired rates. The demand equation for a product shows us that the quantity produced varies with the price according to the equation $q = 1,200/p$. The price is increasing at a rate of \$0.06 per month. How fast is the demand for this product changing when the price is \$6.00?

Exercise 2: The demand function for a product is $q = 1,000 - 0.2\sqrt{p}$. The price is increasing at a rate of \$0.10 per week. How fast is the revenue changing when the price of one unit is \$36.00? Hint: First find the revenue as a function of price.

Exercise 3: A pebble is dropped into a pond. The area of the circle enclosed by the outermost ripple is increasing at a rate of 20cm^2 per second. How fast is the radius of that ripple increasing when the area inside the circle is 64π ?

Exercise 4: A child is standing beside a straight river that is 100m wide. A boat is moving down the center of the river at a speed of $6\text{m}/\text{sec}$. How fast is the distance between the child and the boat changing when the boat is 75 meters from the child?

Exercise 5: A cylindrical container with a diameter of 3 meters is being filled with water. The water is flowing into the container at a rate of $5\text{m}^3/\text{sec}$. How fast is the water moving up the side of the container?

Exercise 6: Andrea and Brad start walking away from home at the same time. Andrea is walking east at $5\text{km}/\text{h}$ (km per hour). Bob is walking south at $6\text{km}/\text{h}$. How fast are they moving away from each other after half an hour?