

Name _____

Do #3–4 on a separate sheet of paper. Show all work.

The rest are just more practice problems.

1. A spherical balloon is inflated with helium at the rate of 100π cubic feet per minute. How fast is the balloon's radius increasing at the instant the radius is 5 feet. How fast is the surface area increasing?
2. When a circular plate of metal is heated in an oven, its radius increases at the rate of 0.01 centimeters per minute. At what rate is the plate's area increasing when the radius is 50 centimeters.
3. A rocket is launched vertically upward from a point 2 miles west of an observer on the ground. When the angle of elevation (from the horizontal) of the observer's line of sight to the rocket is $\pi/6$ radians, that angle is increasing at $\pi/36$ radians per second. What is the speed of the rocket at that time?
4. A rectangular lot adjacent to a road is to be enclosed by a fence that is 4 feet tall. The fence along the road is to be reinforced and costs \$7 per square foot. Fencing that costs \$5 per square foot can be used for the other three sides. What is the largest area that can be enclosed for a cost of \$14400, and what are the dimensions that give this maximum area?
5. Find the points on the hyperbola $x^2/4 - y^2 = 1$ that are closest to the point $(5, 0)$.
6. An excursion train is to be run to the World Series. The railroad company sets the fare at \$10 per ticket if 200 people go but agrees to lower the cost of all tickets by 2 cents each for every passenger in excess of 200. How many passengers will produce the greatest revenue, and what is the maximum revenue? (The train has a capacity of 450 passengers.)
7. A right circular cylinder is to be designed to hold 12 fluid ounces of a soft drink and to use the minimal amount of material in its construction. Find the required dimensions, assuming that 1 fluid ounce is equal to 1.80469 cubic inches.
8. A closed box with a square base is to have a given volume. If the material used in the bottom costs 20% more per square inch than the material in the sides, and the material in the top costs 50% more per square inch than that of the sides, find the most economical proportions for the box.
9. Sand falls from a conveyer belt at the rate of 10 cubic feet per minute onto a conical pile. The radius of the base of the pile is always equal to half the pile's height. How fast is the height growing when the pile is 5 feet high?