

Related Rate Homework

1.

The radius r of a sphere is increasing at a constant rate of 0.04 centimeters per second.

(Note: The volume of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.)

- At the time when the radius of the sphere is 10 centimeters, what is the rate of increase of its volume?
- At the time when the volume of the sphere is 36π cubic centimeters, what is the rate of increase of the area of a cross section through the center of the sphere?
- At the time when the volume and the radius of the sphere are increasing at the same numerical rate, what is the radius?

2.

A container has the shape of an open right circular cone, as shown in the figure above. The height of the container is 10 cm and the diameter of the opening is 10 cm. Water in the container is evaporating so that its depth h is changing at the constant rate of $\frac{-3}{10}$ cm/hr.

(The volume of a cone of height h and radius r is given by $V = \frac{1}{3}\pi r^2 h$.)

- Find the volume V of water in the container when $h = 5$ cm. Indicate units of measure.
- Find the rate of change of the volume of water in the container, with respect to time, when $h = 5$ cm. Indicate units of measure.
- Show that the rate of change of the volume of water in the container due to evaporation is directly proportional to the exposed surface area of the water. What is the constant of proportionality?

