

Worksheet #16: Related Rates

Basic Guidelines:

1. Draw a helpful figure, label and identify the variables that change with time.
2. Write an equation relating these variables over time.
3. Differentiate implicitly on both sides of the equation with respect to time.
4. Substitute in the given values and solve for the desired quantity.

These problems are a small sample of related rate problems.

1. A spherical balloon is to be deflated so that its radius decreases at a constant rate of 5 cm/min. At what rate must air be removed when the radius is 9 cm? (Hint: The volume formula for a sphere is: $V = \frac{4}{3}\pi r^3$)

2. A 13-ft ladder is leaning against a wall. If the top of the ladder is sliding down the wall at a rate of 2 ft/s, how fast will the foot of the ladder be moving away from the wall when the top is 5 feet above the ground?

3. A conical water tank with the vertex down has a radius of 5 feet at the top and is 12 feet high. If water flows into the tank at a rate of 10 ft³/min, how fast is the depth of the water increasing when the water is 8 feet deep? (Hint: The volume formula for a cone is: $V = \frac{1}{3}\pi r^2 h$)

