

## INTRODUCTION TO RELATED RATES

Use proper notation and units throughout.

1. A. What is the volume formula for a sphere?

B. How fast does the volume of a spherical balloon change with respect to its radius?

C. How fast does the volume of a balloon change with respect to time?

D. If the radius is increasing at a constant rate of 0.03 inches per minute, how fast is the volume of the balloon changing at the time when its radius is 5 inches?

2. A. What is the surface area formula for a closed cylinder?

B. If the radius of a cylinder is always  $\frac{1}{4}$  of the height of the cylinder, how fast does the surface area of the cylinder change with respect to its height? with respect to its radius? Include proper notation.

C. How fast does the surface area of a cylinder change with respect to time (assuming both radius and height change with respect to time)?

D. The surface area of a cylinder is increasing by  $2\pi$  square inches per hour and the height is decreasing by 0.1 inches per hour when the radius is 16 inches and the height is 7 inches. How fast is the radius of the cylinder changing?