

Example 1 Air is being pumped into a spherical balloon at a rate of $5 \text{ cm}^3/\text{min}$. Determine the rate at which the radius of the balloon is increasing when the diameter of the balloon is 20 cm.

Example 2 A 15 foot ladder is resting against the wall. The bottom is initially 10 feet away from the wall and is being pushed towards the wall at a rate of $\frac{1}{4} \text{ ft/sec}$. How fast is the top of the ladder moving up the wall 12 seconds after we start pushing?

Example 3 Two people are 50 feet apart. One of them starts walking north at a rate so that the angle shown in the diagram below is changing at a constant rate of 0.01 rad/min . At what rate is distance between the two people changing when $\theta = 0.5$ radians?

Example 4 A tank of water in the shape of a cone is leaking water at a constant rate of 2ft per hour. The base radius of the tank is 5 ft and the height of the tank is 14 ft.

- (a) At what rate is the depth of the water in the tank changing when the depth of the water is 6 ft?
- (b) At what rate is the radius of the top of the water in the tank changing when the depth of the water is 6 ft?

Example 6 A light is on the top of a 12 ft tall pole and a 5ft 6in tall person is walking away from the pole at a rate of 2 ft/sec.

- (a) At what rate is the tip of the shadow moving away from the pole when the person is 25 ft from the pole?
- (b) At what rate is the tip of the shadow moving away from the person when the person is 25 ft from the pole?