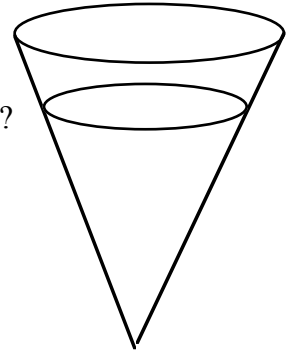


Related Rates Problems 2

1. A conical water tank has a diameter of 6 m and a depth of 5 m.



a) If the water is 3 m deep, and is rising at 5 m/hr, at what rate is the volume changing?

b) If the water is being pumped out at $2 \text{ m}^3/\text{hr}$, at what rate is the depth changing

i. When the water is 4 m deep?

ii. When the last drop is pumped out?

c) If water flows out under the action of gravity, the rate of change of volume is directly proportional to the square root of the water's depth. Suppose that the volume V is decreasing at $0.5 \text{ m}^3/\text{hr}$ when the depth is 4 m.

i. Find dV/dt in terms of the depth of the water.

ii. Find dV/dt when the water is 0.64 m deep.

iii. Find the rate of change of depth when the water is 0.64m deep.

2. A (square) baseball diamond has sides that are 90 feet long. A player that is 26 feet from third base is running at a speed of 30 feet per second. At what rate is the player's distance from home plate changing?

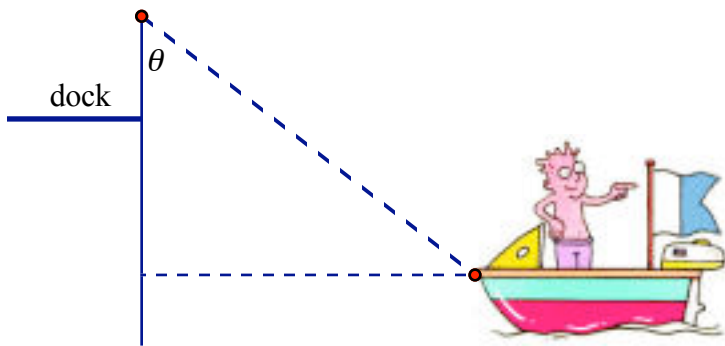


3. The Incredible Shrinking Man shrinks at a rate of 2 inches/min. However, his shoes do not shrink and remain 10 inches long. If the Incredible Shrinking Man started out being 7 feet tall, how fast is the distance from the top of his head to the tip of his shoes changing when he is half his original height?



4. A man walks along a straight path at a speed of 4 ft/sec. A searchlight is located on the ground 20 feet from the path and is kept focused on the man. At what rate is the searchlight rotating when the man is 15 ft from the point on the path closest to the searchlight?

5. A boat is pulled by a winch on a dock and the winch is 12 feet above the deck of the boat. The winch pulls the rope at a rate of 4 feet per second.
- Find the speed of the boat when 13 feet of rope is out.
 - What happens to the speed of the boat as it gets closer and closer to the dock?
 - At what rate is the angle θ changing at that moment?



6. *Cost, Revenue, and Profit*

A company can manufacture x items at a cost of $C(x)$ dollars, a sales revenue of $R(x)$ dollars, and a profit of $P(x) = R(x) - C(x)$ dollars (all amounts in thousands). Find dC/dt , dR/dt , and dP/dt for the following values of x and dx/dt .

- $R(x) = 9x$, $C(x) = x^3 - 6x^2 + 15x$, and $dx/dt = 0.1$, when $x = 2$
- $R(x) = 70x$, $C(x) = x^3 - 6x^2 + 45/x$, and $dx/dt = 0.5$, when $x = 1.5$