**544.** Suppose Aaron is pumping water into a tank (in the shape of an inverted right circular cone) at a rate of 1600 ft^3/min. If the altitude is 10 ft. and the radius of the base is 5 ft., find the rate at which the radius is changing when the height of the water is 7 ft.

549. A cone (vertex down) with height 10 inches and radius 2 inches is being filled with water at a constant rate of 2 in^3/sec. How fast is the surface of the water rising when the depth of the water is 6 inches?

553. On a morning of a day when the sun will pass directly overhead, the shadow of an 80-ft building on level ground is 60 feet long. At the moment in question, the angle θ the sun's rays make with the ground is increasing at the rate of $\frac{3\pi}{2000}$ radian/min. At what rate is the shadow decreasing? (Express your answer in inches per minute.)

*7. A balloon leaves the ground 500 feet away from an observer and rises vertically at the rate of 140 feet per minute. At what rate is the angle of inclination of the observer's line of sight increasing at the instant when the balloon is exactly 500 feet above the ground?
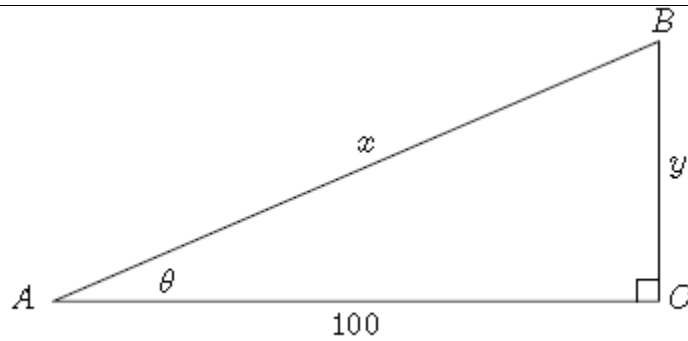
655 (1988BC). The figure above represents an observer at point A watching balloon B as it rises from point C. The balloon is rising at a constant rate of 3 meters per second and the observer is 100 meters from point C.

a) Find the rate of change in x at the instant when y = 50.

b) Find the rate of change in the area of right triangle BCA at the instant when y = 50.

c) Find the rate of change in θ at the instant when y = 50.

551. A streetlight is 15 feet above the sidewalk. Jonathan, who is 7 feet tall, walks away from the light at the rate of 5 feet per second.

a) Determine a function relating the length of Jonathan's shadow to his distance from the base of the streetlight.

b) Determine the rate at which Jonathan's shadow is lengthening at the moment that he is 20 feet from the base of the light.

31. *Moving Race Car* You are videotaping a race from a stand 132 ft. from the track, following a car that is moving at 180 mph (264 ft./sec) as shown in the figure. About how fast will your camera angle θ be changing when the car is right in front of you? A half second later?

Camera

θ

132'

Race Car