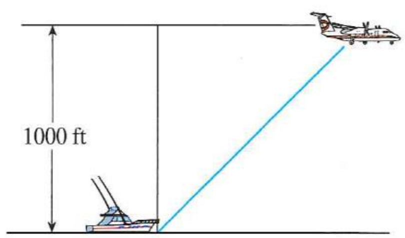
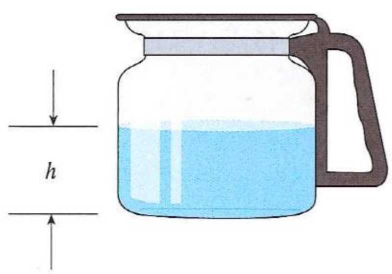
60. **Blowing Soap Bubbles** Carlos is blowing air into a soap bubble at the rate of 8 cm^3/sec. Assuming that the bubble is spherical, how fast is its radius changing at the instant of time when the radius is 10 cm? How fast is the surface area of the bubble changing at that instant of time?

61. **Coast Guard Patrol Search Mission** The pilot of a Coast Guard patrol aircraft on a search mission had just spotted a disabled fishing trawler and decided to go in for a closer look. Flying in a straight line at a constant altitude of 1000 ft and at a steady speed of 264 ft/sec, the aircraft passed directly over the trawler. How fast was the aircraft receding from the trawler when it was 1500 ft from the trawler?



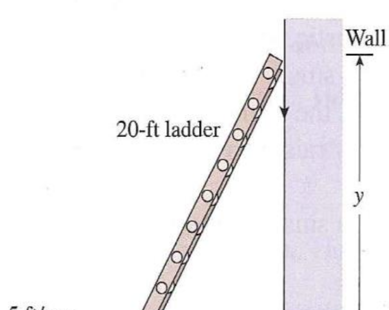
62. **Filling a Coffee Pot** A coffee pot in the form of a circular cylinder of radius 4 in. is being filled with water flowing at a constant rate. If the water level is rising at the rate of 0.4 in./sec, what is the rate at which water is flowing into the coffee pot?



63. **Movement of a Shadow** A 6-ft tall man is walking away from a street light 18 ft high at a speed of 6 ft/sec. How fast is the tip of his shadow moving along the ground?

64. **A Sliding Ladder** A 20-ft ladder leaning against a wall begins to slide. How fast is the top of the ladder sliding down the wall at the instant of time when the bottom of the ladder is 12 ft from the wall and sliding away from the wall at the rate of 5 ft/sec?

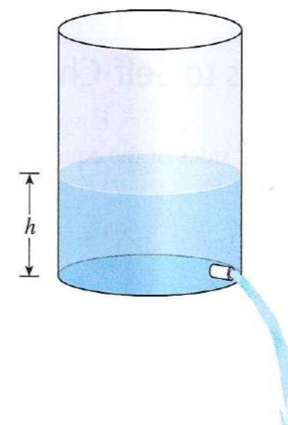
Hint: Refer to the accompanying figure. By the Pythagorean Theorem, $x^2 + y^2 = 400$. Find dy/dt when $x = 12$ and $dx/dt = 5$.



65. **A Sliding Ladder** The base of a 13-ft ladder leaning against a wall begins to slide away from the wall. At the instant of time when the base is 12 ft from the wall, the base is moving at the rate of 8 ft/sec. How fast is the top of the ladder sliding down the wall at that instant of time?

Hint: Refer to the hint in Problem 64.

66. **Flow of Water from a Tank** Water flows from a tank of constant cross-sectional area 50 ft^2 through an orifice of constant cross-sectional area 1.4 ft^2 located at the bottom of the tank (see the figure).



Initially, the height of the water in the tank was 20 ft, and its height t sec later is given by the equation

$$2\sqrt{h} + \frac{1}{25}t - 2\sqrt{20} = 0 \qquad (0 \le t \le 50\sqrt{20})$$

How fast was the height of the water decreasing when its height was 8 ft?

67. **Volume of a Gas** In an adiabatic process (one in which no heat transfer takes place), the pressure P and volume V of an ideal gas such as oxygen satisfy the equation $P^5V^7 = C$, where C is a constant. Suppose that at a certain instant of time, the volume of the gas is 4 L, the pressure is 100 kPa, and the pressure is decreasing at the rate of 5 kPa/sec. Find the rate at which the volume is changing.

68. **Mass of a Moving Particle** The mass m of a particle moving at a velocity v is related to its rest mass m_0 by the equation

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

where c $(2.98 \times 10^8$ m/sec$)$ is the speed of light. Suppose an electron of mass 9.11×10^{-31} kg is being accelerated in a particle accelerator. When its velocity is 2.92×10^8 m/sec and its acceleration is 2.42×10^5 m/sec^2, how fast is the mass of the electron changing?

In Exercises 69–74, determine whether the statement is true or false. If it is true, explain why it is true. If it is false, give an example to show why it is false.

69. The equation $x^2 + y^2 + 1 = 0$ defines y as a function