

**Problem 1.** A 13 foot ladder is leaning against a wall. If the top of the ladder slips down the wall at a rate of 2 feet per second, how fast will the foot of the ladder be moving away from the wall when the top is 5 feet above the ground?

**Problem 2.** An aircraft flying at constant altitude travels at a constant speed of 600 miles per hour. An anti-aircraft missile is fired on a straight line perpendicular to the flight path of the aircraft so that the two will collide. At the instant the aircraft is 2 miles from the impact point, the missile is 4 miles away and travelling at 1200 miles per hour. At that instant, how rapidly is the distance between the missile and the aircraft decreasing?

**Problem 3.** A boat is pulled into a dock by means of a rope attached to a pulley on the dock. The rope is attached to the bow of the boat at a point 10 feet below the pulley. If the boat is approaching the dock at a rate of 12 feet per minute when 125 feet of rope is out, how fast is the rope being pulled?

**Problem 4.** A rocket, rising vertically, is tracked by a radar station that is on the ground 5 miles from the launchpad. How fast is the rocket rising when it is 4 miles high and its distance from the radar station is increasing at a rate of 2000 miles per hour?

**Problem 5.** Let  $V$  be the volume of a cylinder having height  $h$  and radius  $r$ , and assume that  $h$  and  $r$  vary with time. At a certain instant, height is 6 inches and increasing at 1 inch per second, while the radius is 10 inches and decreasing at 1 inch per second. How fast is the volume changing at this instant?

**Problem 6.** Water drains through a conical filter 16cm high and 4cm radius on the top. Suppose that the liquid flows out at a constant rate of 2 cubic centimeters per minute. At what rate is the depth changing when liquid in the cone is 8cm deep?