

1. Each side of a square is increasing at a rate of 6 cm/s. At what rate is the area of the square increasing when the area of the square is  $16 \text{ cm}^2$ ?
2. A cylindrical tank with radius 5 m is being filled with water at a rate of  $3 \text{ m}^3/\text{min}$ . How fast is the height of the water increasing?
3. Suppose  $y = \sqrt{2x + 1}$ , where  $x$  and  $y$  are functions of  $t$ .
  - (a) If  $dx/dt = 3$ , find  $dy/dt$  when  $x = 4$ .
  - (b) If  $dy/dt = 5$ , find  $dx/dt$  when  $x = 12$ .
4. If  $x^2 + y^2 + z^2 = 9$ ,  $dx/dt = 5$ , and  $dy/dt = 4$ , find  $dz/dt$  when  $(x, y, z) = (2, 2, 1)$ .
5. A plane flying horizontally at an altitude of 1 mi and a speed of 500 mi/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 mi away from the station.
6. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. How fast is the tip of his shadow moving when he is 40 ft from the pole?
7. Two cars start moving from the same point. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?
8. A man starts walking north at 4 ft/s from a point  $P$ . Five minutes later a woman starts walking south at 5 ft/s from a point 500 ft due east of  $P$ . At what rate are the people moving apart 15 min after the woman starts walking?
9. Water is leaking out of an inverted conical tank at a rate of  $10,000 \text{ cm}^3/\text{min}$  at the same time that water is being pumped into the tank at a constant rate. The tank has height 6 m and the diameter at the top is 4 m. If the water level is rising at a rate of 20 cm/min when the height of the water is 2 m, find the rate at which water is being pumped into the tank.