RELATED RATES PRACTICE

1. An angler has a fish at the end of a line. The line is reeled in at the rate of 2 ft/sec from a bridge 30 ft above the water. At what rate is the fish moving through the water when the length of the line is 50 ft? At what rate is the angle between the rod and the line changing at this instant?
2. A car traveling 60 mph northward on a straight road crosses a railroad track perpendicular to the road. A train going 80 mph directly eastward crosses the road 15 min later. At what rate are the car and train separating 30 min after the train has crossed the road?
3. Water flows at the rate of 2 ft3/min into a tank in the shape of an inverted right circular cone of altitude 6 ft and radius 2 ft. At what rate is the surface of the water rising when the tank is half full? (Contains ½ of possible volume)
4. A baseball diamond is a 90-ft square. A player hits a ball along the third base line at 100 ft/sec and runs to first base at 25 ft/sec.
   1. At what rate is the distance between the ball and first base changing when the ball is halfway to third base?
   2. At what rate is the distance between the ball and the player changing when the ball is halfway to third base?
5. The edges of an equilateral triangle are increasing at the rate of 1 mm/sec. How fast is the area of the triangle increasing when the area is 14 mm?
6. A spherical balloon is inflated with gas at the rate of 300 cubic centimeters per minute. How fast is the radius of the balloon increasing when the radius is 30 cm? How fast is the surface area changing at this instant?
7. Sand falls from a conveyor belt at the rate of 10 m3/sec onto the top of a conical pile. The height of the pile is always three-eighths of the base diameter. How fast are the (a)height and (b) radius changing when the pile is 4 m high? (Put answers in m/min).
8. Inge flies a kite at a height of 300 ft. The wind carrying the kite horizontally away at a rate of 25 ft/sec. How fast must she let out the string when the kite is 500 ft away from her?

Ans: 1. –2.5 ft/s b. –0.03 rad/sec 2. 97.994 mph 3. 0.2526 ft/min 4a. 44.721 ft/sec b. 103.077 ft/s

5. 4.924 mm2/sec 6. 0.0265 cm/min b. 19.999 cm2/min 7. 0.1119 m/min b. 0.1492 m/min 8. 20 ft/s