

3.7 Related Rates

Name:

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P 2. Assume that both x and y are differentiable functions of t .

(a) Find dy/dt when $x = 4$ given $dx/dt = 3$.

$$y = \sqrt{x}$$

(b) Find dx/dt when $x = 25$ given $dy/dt = 2$.

$$y = \sqrt{x}$$

P 4. Assume that both x and y are differentiable functions of t .

(a) Find dy/dt when $x = 3, y = 4$ given $dx/dt = 8$.

$$x^2 + y^2 = 25$$

(b) Find dx/dt when $x = 4, y = 3$ given $dy/dt = -2$.

$$x^2 + y^2 = 25$$

P 6. A point is moving along the graph of

$$y = \frac{1}{1 + x^2}$$

and the rate of change along the x -axis is given by $dx/dt = 6$ inches per second. Find dy/dt at

- (a) $x = -2$
- (b) $x = 0$
- (c) $x = 2$

P 11. The radius of a circle is increasing at a rate of 4 centimeters per minute. Find the rates of change of the area when

- (a) $r = 8$ centimeters.
- (b) $r = 32$ centimeters.

P 14. A spherical balloon is inflated with gas at the rate of 800 cubic centimeters per minute. How fast is the radius of the balloon increasing at the instant the radius is

- (a) 30 centimeters
- (b) 60 centimeters

P 16. All edges of a cube are expanding at a rate of 6 centimeters per second. How fast is the surface area changing when each edge is

- (a) 2 centimeters
- (b) 10 centimeters

P 18. A conical tank (with vertex down) is 10 feet across the top and 12 feet deep. Water is flowing into the tank at a rate of 10 cubic feet per minute. Find the rate of change of the depth of the water when the water is 8 feet deep.

P 20. A trough is 12 feet long and 3 feet across the top. Its ends are isosceles triangles with altitudes of 3 feet.

- (a) Water is being pumped into the trough at 2 cubic feet per minute. How fast is the water level rising when the depth h is 1 foot?
- (b) The water is rising at a rate of $3/8$ inch per minute when $h = 2$. Determine the rate at which water is being pumped into the trough.

P 21. A ladder 25 feet long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 feet per second.

- (a) How fast is the top of the ladder moving down the wall when its base is 7 feet, 15 feet, and 24 feet from the wall?
- (b) Consider the triangle formed by the side of the house, the ladder, and the ground. Find the rate at which the area of the triangle is changing when the base of the ladder is 7 feet from the wall.
- (c) Find the rate at which the angle between the ladder and the wall of the house is changing when the base of the ladder is 7 feet from the wall.