

## RELATED RATES - EXTRA PRACTICE

### Find the missing value

1) Given  $x^2 + y^2 = 34$  find  $\frac{dx}{dt}$ ,  
when  $x = 5$ ,  $y = 3$ , and  $\frac{dy}{dt} = 2$ .

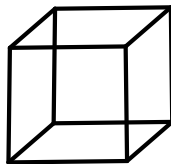
2) Given  $x^2y = 98$  find  $\frac{dy}{dt}$ ,  
when  $x = -7$ ,  $y = 2$ , and  $\frac{dx}{dt} = 5$ .

3) The radius of a sphere is increasing at a rate of 8 ft/min.  $\left( V = \frac{4}{3}\pi r^3 \right)$   $(A = 4\pi r^2)$

- a) Find the rate of change of the volume when  $r = 4$ .    b) How fast is the surface area changing when  $r = 4$ ?

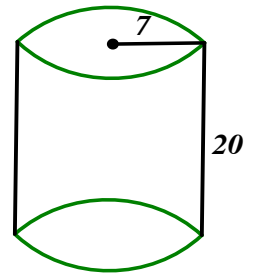
4) All edges of a cube are expanding at a rate of 6 cm/s. How fast is the.....

- a) volume changing when each edge is 2cm?      b) surface area changing when each edge is 2cm?

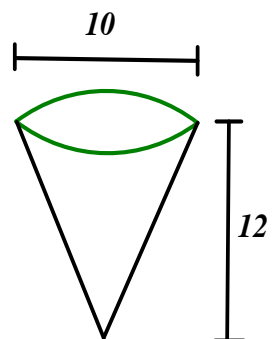


- 5) Water is spilling onto the ground and forming a circular shape. The radius of the puddle is changing at the rate of 2 inches per second. How fast is the....
- a) area of the circle changing when the area is  $121\pi$ ?      b) circumference changing when the radius is 7 in.?

- 6) A cylinder with radius 7 ft and height 20 feet is losing water at a rate of  $6 \text{ ft}^3/\text{min}$ . How fast is the height changing when  $h = 8$ ? How fast is the height changing when  $h = 16$ ?



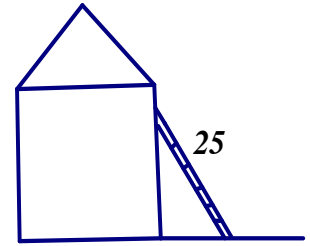
- 7) A conical tank (with vertex down) is 10 feet across the top and 12 feet deep. If water is flowing into the tank at a rate of  $10 \text{ ft}^3 / \text{min}$ ., find the rate of change of the depth of the water when the water is 8 feet deep?



**RELATED RATES HW #2**    NAME: \_\_\_\_\_    PER: \_\_\_\_\_

1) 25 foot ladder is leaning against the wall of a house. The base of the ladder is pulled away at 2 ft. per second.

a) How fast is the ladder sliding down the wall when the base of the ladder is 7 ft. from the wall?

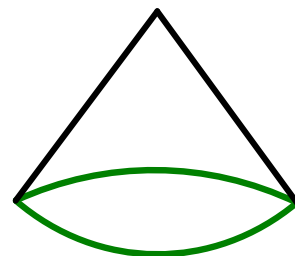


b) How fast is the area of the triangle formed changing at this time?

c) How fast is the angle between the ladder and the wall of the house changing at this time?

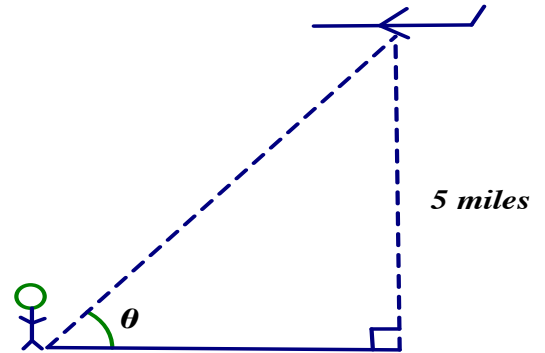
2) A person 6 ft. tall walks away from a streetlight that is 15 feet above the ground. The person is walking away from the light at a constant rate of 5 feet per second. At what rate, in feet per second, is the length of the shadow changing?

- 3) At a sand and gravel plant, sand is falling off a conveyor and onto a conical pile at a rate of  $10 \text{ ft}^3 / \text{min}$ . The diameter of the base of the cone is approximately three times the altitude. At what rate is the height of the pile changing when the pile is 15 feet high?

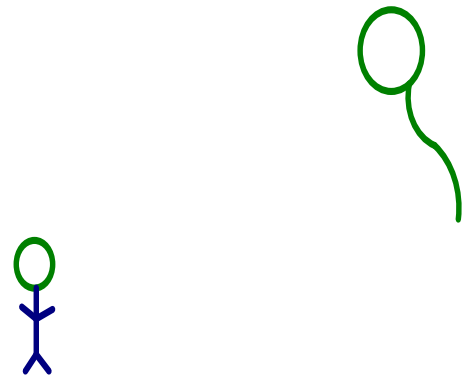


## RELATED RATES

- 1) An airplane flies at an altitude of 5 miles toward a point directly over an observer. The speed of the plane is 600 miles per hour. Find the rates at which the angle of elevation  $\theta$  is changing when  $\theta = 30^\circ$ .



- 2) A balloon rises at a rate of 4 m/s from a point on the ground 50 meters from an observer. Find the rate of change of the angle of elevation of the balloon from the observer when the balloon is 50 meters above the ground.



3) An airplane is flying in still air with an airspeed of 275 miles per hour. If it is climbing at an angle of  $18^\circ$ , find the rate at which it is gaining altitude.

4) An airplane is flying at an altitude of 5 miles and passes over a radar antenna. When the plane is 10 miles away ( $s = 10$ ), the radar detects that the distance  $s$  is changing at a rate of 240 miles per hour. What is the speed of the plane?

