

4.4

Related Rates Homework

Name _____ Date _____ Period _____

1. Assume x and y are both differentiable functions of t . Find $\frac{dx}{dt}$ given $x = -1$ and $\frac{dy}{dt} = 8$. For the relation: $4x^2 + 3y^3 = 28$.

2. Water is falling on a surface, wetting a circular area that is expanding at a rate of $10 \text{ mm}^2/\text{sec}$. How fast is the radius of the wetted area expanding when the radius is 116 mm ? (Round approximations to four decimal places.)

3. A spherical balloon is being inflated. The radius of the balloon is increasing at a rate of $\frac{1}{\pi}$ inches per second. Find the rate at which the volume is increasing when the radius is 1 inch.

4. All edges of a cube are expanding at a rate of 3 centimeters per second. How fast is the volume changing when each edge is 10 centimeters?

5. An aircraft is climbing at a 30° angle to the horizontal. How fast is the aircraft gaining altitude if its speed is 500 miles per hour?

6. A man 6-ft tall walks at a rate of 5 ft/sec. away from a lamppost that is 22-ft high. At what rate is the length of his shadow changing when he is 60 feet away from the lamppost?

7. The height of a cylinder with a radius of 4 cm is increasing at a rate of 2 centimeters per minute. Find the rate of change of the volume with respect to time when the height is 10 centimeters.

8. A conical water tank is 24 feet high and has a radius of 10 feet at the top. If water flows into the tank at the rate of 20 cubic feet per minute, how fast is the depth of the water increasing when the water is 16 feet deep?

9. Eleni and Analisa are driving to Ms. A's wedding. Eleni is going east at a rate of 50 mph and Analisa is driving south at 38 mph. At what rate is the distance between the cars changing when Eleni is 1 mile and Analisa is $\frac{3}{4}$ mile from the wedding?

10. A hot air balloon rises at a rate of 8 feet per second from a point on the ground 60 feet from an observer. Find the rate of change of the angle of elevation when the balloon is 25 feet above the ground.

11. A trough is 10 feet long and the ends have the shape of isosceles triangles that measure 3 feet across at the top and have a height of 1 foot. If the trough is being filled with water at a rate of 12 ft^3 per minute, how fast is the water level rising when the water is 6-inches deep?

12. A container is the shape of an inverted right circular cone has a radius of 5 inches at the top and a height of 7 inches. At the instant when the water in the container is 3 inches deep, the surface level is falling at the rate of -7 in/sec . Find the rate at which water is being drained.

13. Sand is falling from a conveyor at a rate of $28 \text{ ft}^3/\text{min}$ onto the top of a conical pile. The height of the pile is always $\frac{1}{2}$ of the base diameter. How fast is the height changing when the pile is 12 feet high?