Calculus Name_____

Related Rates

Date_____ Period____

Solve each related rate problem.

1) A perfect cube shaped ice cube melts so that the length of its sides are decreasing at a rate of 2 mm/sec. Assume that the block retains its cube shape as it melts. At what rate is the volume of the ice cube changing when the sides are 6 mm each?

2) A hypothetical square grows so that the length of its sides are increasing at a rate of 7 m/min. How fast is the area of the square increasing when the sides are 2 m each?

3) A spherical snowball melts so that its radius decreases at a rate of 2 in/sec. At what rate is the volume of the snowball changing when the radius is 8 in?

4) Oil spilling from a ruptured tanker spreads in a circle on the surface of the ocean. The radius of the spill increases at a rate of 7 m/min. How fast is the area of the spill increasing when the radius is 11 m?

5) A conical paper cup is 10 cm tall with a radius of 10 cm. The bottom of the cup is punctured so that the water level goes down at a rate of 3 cm/sec. At what rate is the volume of water in the cup changing when the water level is 2 cm?

6) A hypothetical cube grows at a rate of 27 m^3/min. How fast are the sides of the cube increasing when the sides are 4 m each?

7) A 13 ft ladder is leaning against a wall and sliding towards the floor. The top of the ladder is sliding down the wall at a rate of 8 ft/sec. How fast is the base of the ladder sliding away from the wall when the base of the ladder is 5 ft from the wall?

8) An observer stands 400 ft away from a launch pad to observe a rocket launch. The rocket blasts off and maintains a velocity of 200 ft/sec. Assume the scenario can be modeled as a right triangle. How fast is the angle of elevation (in radians/sec) from the observer to rocket changing when the rocket is 300 ft from the ground?

9) A spherical balloon is deflated at a rate of $\frac{32\pi}{3}$ cm³/sec. At what rate is the radius of the balloon changing when the radius is 4 cm?

10) Oil spilling from a ruptured tanker spreads in a circle on the surface of the ocean. The area of the spill increases at a rate of 4π m²/min. How fast is the radius of the spill increasing when the radius is 3 m?

11) An observer stands 1200 ft away from a launch pad to observe a rocket launch. The rocket blasts off and maintains a velocity of 200 ft/sec. Assume the scenario can be modeled as a right triangle. How fast is the observer to rocket distance changing when the rocket is 500 ft from the ground?

12) A spherical balloon is inflated so that its radius (r) increases at a rate of $\frac{4}{r}$ cm/sec. How fast is the volume of the balloon increasing when the radius is 9 cm?

13) Oil spilling from a ruptured tanker spreads in a circle on the surface of the ocean. The radius (r) of the spill increases at a rate of $\frac{9}{r}$ m/min. How fast is the area of the spill increasing when the radius is 9 m?

14) A conical paper cup is 10 cm tall with a radius of 20 cm. The cup is being filled with water so that the water level (h) rises at a rate of $\frac{4}{h}$ cm/sec. At what rate is water being poured into the cup when the water level is 8 cm?

15) A perfect cube shaped ice cube melts so that the length of its sides (s) are decreasing at a rate of $\frac{3}{s}$ mm/sec. Assume that the block retains its cube shape as it melts. At what rate is the volume of the ice cube changing when the sides are 6 mm each?

16) A hypothetical square grows so that the length of its sides (s) are increasing at a rate of $\frac{5}{s}$ m/min. How fast is the area of the square increasing when the sides are 6 m each?