AP Calculus Name: _____

4.5 Worksheet Block: _____

1. Use linearization to approximate $f(0.1)$ if $f(x)=\frac{1}{\sqrt{4+x}}$. Find the error for your approximation.

2. If $y=\sin\left(x^2-3\right)$, find dy if $x=\sqrt{3}$ and $dx=\frac{1}{10}$.

3. The radius of a ball bearing is measured to be 0.7 inch. If the measurement is correct to within 0.01 inch, estimate the error in the volume of the ball bearing.

4. Estimate the maximum allowable percent error in measuring the side of a square if the error in computing the area cannot exceed 2.5%.

Related Rates WS Name: _____

1. A 14 ft ladder is leaning against a wall. If the top of the ladder slips down the wall at a rate of 2 ft/s, how fast will the end be moving away from the wall when the top is 6 ft above the ground?

2. An aircraft is climbing at a 45° angle to the horizontal. How fast is the aircraft gaining altitude if its speed is 400 mi/hr?

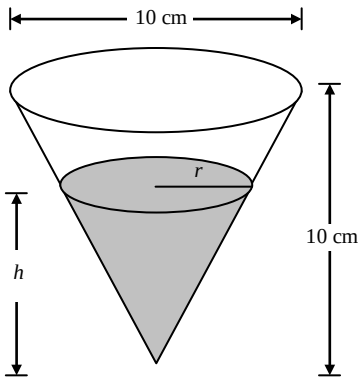
3. A spherical container is deflated such that its radius decreases at a constant rate of 10 cm/min. At what rate must air be removed when the radius is 5 cm?

4. A pebble is dropped into a still pool and sends out a circular ripple whose radius increases at a constant rate of 4 ft/s. How fast is the area of the region enclosed by the ripple increasing at the end of 8 s?

5. Liquid is pouring through a cone shaped filter at a rate of 3 in^3/min. Assume that the height of the cone is 12 inches and the radius of the base of the cone is 3 inches. How rapidly is the depth of the liquid in the filter decreasing when the level is 6 inches deep?

6. Sand pours out of a chute into a conical pile whose height is always one half its diameter. If the height increases at a constant rate of 4 ft/min, at what rate is sand pouring from the chute when the pile is 15 ft high?

7. A container has the shape of an open right circular cone, as shown in the figure to the right. The height of the container is 10 cm and the diameter of the opening is 10 cm. Water in the container is evaporating so that its depth h is changing at the constant rate of $\frac{-3}{10}$ cm/hr.



(The volume of a cone of height h and radius r is given by $V = \frac{1}{3}\pi r^2 h$.)

a) Find the volume V of water in the container when h = 5 cm. Indicate units of measure.

b) Find the rate of change of the volume of water in the container, with respect to time, when h = 5 cm. Indicate units of measure.

c) Show that the rate of change of the volume of water in the container due to evaporation is directly proportional to the exposed surface area of the water. What is the constant of proportionality?