

AP CALC WEEK 3 HW

Date _____ Period _____

Solve each related rate problem.

- 1) A conical paper cup is 30 cm tall with a radius of 10 cm. The cup is being filled with water at a rate of $\frac{9\pi}{4}$ cm³/sec. How fast is the water level rising when the water level is 9 cm?

- 2) A spherical snowball is rolled in fresh snow, causing it grow at a rate of 36π in³/sec. How fast is the radius of the snowball increasing when the radius is 8 in?

- 3) Water leaking onto a floor forms a circular pool. The area of the pool increases at a rate of 9π cm²/min. How fast is the radius of the pool increasing when the radius is 6 cm?

Answers to AP CALC WEEK 3 HW (ID: 1)

1) V = volume of material in cone h = height t = time

$$\text{Equation: } V = \frac{\pi h^3}{27} \quad \text{Given rate: } \frac{dV}{dt} = \frac{9\pi}{4} \quad \text{Find: } \left. \frac{dh}{dt} \right|_{h=9}$$

$$\left. \frac{dh}{dt} \right|_{h=9} = \frac{9}{\pi h^2} \cdot \frac{dV}{dt} = \frac{1}{4} \text{ cm/sec}$$

2) V = volume of sphere r = radius t = time

$$\text{Equation: } V = \frac{4}{3}\pi r^3 \quad \text{Given rate: } \frac{dV}{dt} = 36\pi \quad \text{Find: } \left. \frac{dr}{dt} \right|_{r=8}$$

$$\left. \frac{dr}{dt} \right|_{r=8} = \frac{1}{4\pi r^2} \cdot \frac{dV}{dt} = \frac{9}{64} \text{ in/sec}$$

3) A = area of circle r = radius t = time

$$\text{Equation: } A = \pi r^2 \quad \text{Given rate: } \frac{dA}{dt} = 9\pi \quad \text{Find: } \left. \frac{dr}{dt} \right|_{r=6}$$

$$\left. \frac{dr}{dt} \right|_{r=6} = \frac{1}{2\pi r} \cdot \frac{dA}{dt} = \frac{3}{4} \text{ cm/min}$$