Kuta Software - Infinite Calculus

Name 1 Key

Related Rates

4.6

Date _____ Period ____

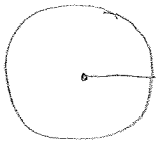
Solve each related rate problem.

1) Water leaking onto a floor forms a circular pool. The radius of the pool increases at a rate of 4 cm/min. How fast is the area of the pool increasing when the radius is 5 cm?

$\frac{dA}{dt}$ $A = \pi r^2$ $r = 5$ $\frac{dr}{dt} = 4$

$\frac{dA}{dt} = 2\pi r \cdot \frac{dr}{dt}$

$\frac{dA}{dt} = 2\pi(5)(4) = 40\pi \text{ cm}^2/\text{min}$



2) 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 9π m²/min. How fast is the radius of the spill increasing when the radius is 10 m?

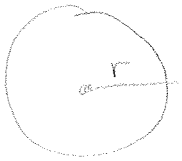
$\frac{dA}{dt} = 9\pi \text{ m}^2/\text{min}$ $\frac{dr}{dt} = ?$ $r = 10$

$A = \pi r^2$

$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$ $9\pi = 2\pi \cdot 10 \cdot \frac{dr}{dt}$

$9\pi = 20\pi \cdot \frac{dr}{dt}$

$\frac{9}{20}$ m/min $\frac{9\pi}{20\pi} = \frac{dr}{dt}$



3) A conical paper cup is 10 cm tall with a radius of 10 cm. The cup is being filled with water so that the water level rises at a rate of 2 cm/sec. At what rate is water being poured into the cup when the water level is 8 cm?

$\frac{dV}{dt} = ?$ $V = \frac{1}{3}\pi r^2 h$

$h = 10, r = 10$ $\frac{dh}{dt} = 2 \text{ cm/sec}$

$h = 8$

$V = \frac{\pi h^3}{3}$

$\frac{dV}{dt} = \pi \cdot h^2 \cdot \frac{dh}{dt}$

$\frac{dV}{dt} = \pi(8)^2 \cdot 2 = 128\pi \text{ cm}^3/\text{sec}$

$\frac{r}{h} = \frac{10}{10}$

$\frac{r}{h} = 10$

$r = 10h$