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Tecnológico de Monterrey Preparatoria

Related Rates

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Related rates

1. A spherical balloon is being filled at a rate of 50in^3/sec, at what rate does the radius increase when the radius is 5in?

$\frac{dv}{dt} = 50\frac{in^3}{sec}$ $\frac{dr}{dt} = ?$ $\frac{dv}{dt} = \frac{4}{3}\pi r^3$ $\frac{dr}{dt} =$ $50 = 4/3\pi 3r^2 \frac{dr}{dt}$

$r = 5in$ $\frac{50}{4/3\pi 3r^2} = \frac{dr}{dt}$ $\frac{dr}{dt} = \frac{1}{2\pi}$ in/s

2. The area of a circle is increasing at a rate of 20in^2/min. Find the rate at which the radius is increasing when the radius is 4in.

$\frac{dA}{dt} = 20\frac{in^2}{min}$ $r = 4in$ $20 = \pi 2(4) dr/dt$ $\frac{dr}{dt} = \frac{5}{2\pi}$ in/min

$\frac{dA}{dt} = \pi 2r dr/dt$ $\frac{20}{\pi 2(4)} = \frac{dr}{dt}$

3. A stone is thrown into a lake and a circular ripple moves out at a constant rate of 0.5 meters/sec. Find the rate at which the circle's area is increasing at r = 0.4 meters.

$r = 0.4$ $\frac{dA}{dt} = 1.26$ $\frac{dA}{dt} = 1.26$

$\frac{dr}{dt} = 0.5 m/s$ $\frac{dA}{dt} = \pi 2(0.4)(0.5)$

4. Air is being pumped into a spherical balloon making the radius change at a constant rate of 0.5cm/sec. Find the rate of change of the volume and the rate of change of the surface area when the radius is 10cm ($V = \frac{4}{3}\pi r^3$, $A = 4\pi r^2$)

? $-\frac{1}{2}$

$\frac{dv}{dt} = 0.5$ cm/sec $\frac{dv}{dt} = 200\pi$ m/sec

$\frac{dv}{dt} = 4/3\pi 3(100)(0.5)$ $\frac{dA}{dt} = 40\pi$ cm/sec

5. A cone is increasing in size as time goes by in such a way that the volume is changing at a constant rate of 75cm^3/min. The height is twice the radius. Determine the rate of change of the height, when the height is 5cm. ($V = \frac{1}{3}\pi r^2 h$)

$V = \pi h^3/6$ $\therefore dV/dt = \pi/12\ 3h^2\ dh/dt = \pi/4(h)^2\ dh/dt$

$75 = \pi/4(5)^2 \frac{dh}{dt}$ $\frac{dh}{dt} = 382$ cm^3/min