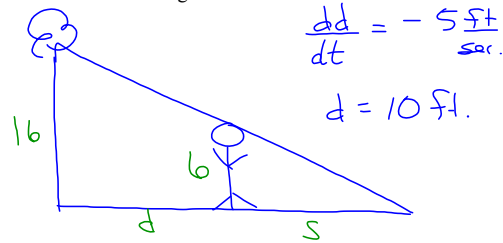


A man 6 ft tall walks at a rate of 5 ft/sec toward a light pole 16 ft. tall. When the man is 10 ft from the base of the light. At what rate is the length of his shadow moving?



$$\frac{6}{s} = \frac{16}{d+s}$$

$$16s = 6d + 6s$$

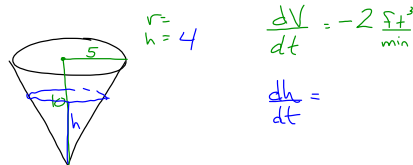
$$10s = 6d$$

$$10 \frac{ds}{dt} = 6 \frac{dd}{dt}$$

$$10 \frac{ds}{dt} = 6(-5)$$

$$\frac{ds}{dt} = -3 \frac{\text{ft.}}{\text{sec.}}$$

Water runs out of a conical tank at the constant rate of 2 cubic feet per minute. The radius at the top of the tank is 5 feet, and the height of the tank is 10 feet. How fast is the water level sinking when the water is 4 feet deep?



$$\frac{5}{10} = \frac{r}{h} \quad V = \frac{1}{3} \pi r^2 h$$

$$r = \frac{1}{2} h$$

$$r \cdot \frac{10}{5} = \frac{h}{r} \cdot r$$

$$\frac{dr}{r} = \frac{h}{2}$$

$$V = \frac{1}{3} \pi \frac{h^3}{4} =$$

$$V = \frac{\pi h^3}{12}$$

$$\frac{dV}{dt} = \frac{\pi}{12} (3h^2) \frac{dh}{dt}$$

$$\frac{dV}{dt} = \frac{\pi}{4} h^2 \frac{dh}{dt}$$

$$-2 = \frac{\pi (4)^2}{4} \frac{dh}{dt}$$

$$-\frac{2}{4\pi} = \frac{dh}{dt}$$

$$-\frac{1}{2\pi} \frac{\text{ft.}}{\text{min}} = \frac{dh}{dt}$$

4.6

$\frac{dx}{dt} = 25 \frac{\text{ft.}}{\text{sec.}}$

$300^2 + x^2 = s^2$

$2x \frac{dx}{dt} = 2s \frac{ds}{dt}$

$2(400)(25) = 2(500) \frac{ds}{dt}$

$100 = 5 \frac{ds}{dt}$

$20 \frac{\text{ft.}}{\text{sec.}} = \frac{ds}{dt}$

22.

$\frac{dy}{dt} = 1$

$\frac{ds}{dt} =$

$x^2 + y^2 = s^2$

$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2s \frac{ds}{dt}$

$x \frac{dx}{dt} + y \frac{dy}{dt} = s \frac{ds}{dt}$

$\frac{dx}{dt} = 17 \frac{\text{ft.}}{\text{sec.}}$

$51(17) + 68(1) = 85 \frac{ds}{dt}$

$11 \frac{\text{ft.}}{\text{sec.}} = \frac{ds}{dt}$

43.

$$V = s^3$$

$$dV = 3s^2 ds$$

$$dV = 3(15)^2 (\pm .2)$$

$$dV = 3(225)(\frac{1}{5})$$

$$dV = \pm 135 \text{ cm}^3$$

55.

$$W = a + \frac{b}{g} \quad a, b \text{ constants}$$

$$dW = \frac{-b}{g^2} dg$$

$$\frac{-b}{(5.2)^2} dg = \frac{-b}{(32)^2} dg$$

$$\begin{array}{r} 3 : 1 \\ 3 \cancel{b} 1 \\ \hline 3 \\ - \end{array}$$

$$\frac{\cancel{+b} dg + (32)^2}{\cancel{(5.2)^2} dg}$$

$$\frac{(32)^2}{(5.2)^2}$$