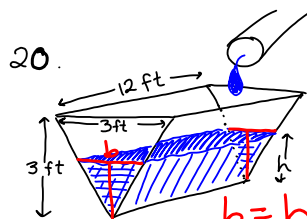


Assignments for the week of 10/3:

- Read 2.5-2.6
- 45 minutes of Khan Academy
- Textbook assignment due Friday, 10/14:
  - 2.5 # 1-39 odd; 43, 47 - Implicit Differentiation
  - 2.6 # 15-23 odd - Related Rates
  - 2.6 # 25, 27, 35 - Related Rates (more challenging problems)

• Upcoming:

- 3.1 # 17-35 odd - Absolute Extrema on an Interval
- 3.2 # 9-21 odd - Rolle's Theorem
- 3.2 # 33-45 odd - Mean Value Theorem
- 3.3 # 17-39 odd - Increasing, Decreasing, and Relative Extrema
- 3.4 # 15-39 odd - Inflection Points and Concavity



$$\frac{dV}{dt} = 2 \frac{\text{ft}^3}{\text{min}}$$

$$\frac{dh}{dt} = ? \text{ when } h = 1 \text{ ft}$$

*b = h*  
 volume of any right prism is (area of base)(height)  
 $V = \frac{1}{2}(\text{base})(\text{height})(\text{length})$   
 $V = \frac{1}{2}(h)(h)(12)$

$$V = 6h^2$$

$$\frac{d}{dt}[V] = \frac{d}{dt}[6h^2]$$

$$\frac{dV}{dt} = 12h \cdot \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{\frac{dV}{dt}}{12h} = \frac{2 \frac{\text{ft}^3}{\text{min}}}{(12 \text{ ft})(1 \text{ ft})}$$

(b)  $\frac{dh}{dt} = \frac{3}{8} \text{ in/min}$  when  $h = 2 \text{ ft}$

$$\frac{dV}{dt} = ?$$

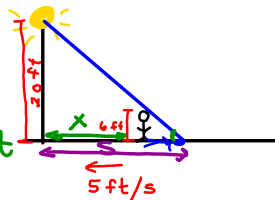
$$= \frac{1}{6} \frac{\text{ft}^3}{\text{min}}$$

$$\frac{dV}{dt} = 12h \cdot \frac{dh}{dt} = (12 \text{ ft})(2 \text{ ft}) \left( \frac{3 \text{ in}}{8 \text{ min}} \right) \cdot \frac{1 \text{ ft}}{12 \text{ in}}$$

$$= \frac{3}{4} \frac{\text{ft}^3}{\text{min}}$$

36. A man 6 ft tall walks toward a light that is 20 ft above the ground at a rate of 5 ft/s. When he is 10 ft from the base of the light,

(a) at what rate is the tip of his shadow moving?



$\frac{ds}{dt} = ?$  when  $x = 10$  ft

Let  $s$  = the distance from the light to the tip of the shadow

Let  $x$  = the distance from the man to the pole

$$\frac{dx}{dt} = -5 \frac{\text{ft}}{\text{s}} \quad \frac{20}{s} = \frac{6}{s-x}$$

$$\frac{d}{dt}[7s] = \frac{d}{dt}[10x]$$

$$20(s-x) = 6s$$

$$20s - 20x = 6s$$

$$7 \cdot \frac{ds}{dt} = 10 \cdot \frac{dx}{dt}$$

$$14s = 20x$$

$$7s = 10x$$

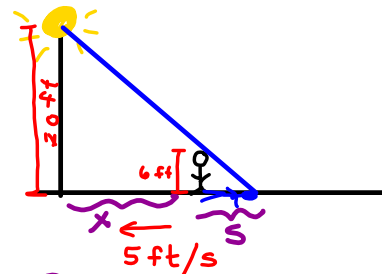
$$\frac{ds}{dt} = \frac{10}{7} (-5 \frac{\text{ft}}{\text{s}})$$

$$= \boxed{-\frac{50}{7} \frac{\text{ft}}{\text{s}}}$$

36. A man 6 ft tall walks toward a light that is 20 ft above the ground at a rate of 5 ft/s. When he is 10 ft from the base of the light,

(a) ~~at what rate is the tip of his shadow moving?~~

(b) at what rate is the length of his shadow changing?



$s$  = length of shadow  $\frac{ds}{dt} = ?$   
 $x$  = distance from man to pole  $\frac{dx}{dt} = -5 \frac{\text{ft}}{\text{s}}$

$$\frac{20}{x+s} = \frac{6}{s}$$

$$20s = 6(x+s)$$

$$20s = 6x + 6s$$

$$14s = 6x$$

$$7s = 3x$$

$$7 \cdot \frac{ds}{dt} = 3 \cdot \frac{dx}{dt}$$

$$\frac{ds}{dt} = \frac{3}{7} \cdot (-5)$$

$$= \boxed{-\frac{15}{7} \frac{\text{ft}}{\text{s}}}$$