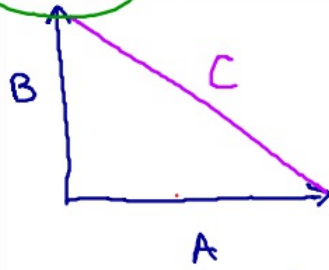




C) Truck A travels east at 40 mi/hr. Truck B travels north at 30 mi/hr. How fast is the distance between the trucks changing 6 minutes later?



$$\frac{dA}{dt} = 40 \text{ mph} \quad \frac{dB}{dt} = 30 \text{ mph}$$

Find $\frac{dC}{dt}$ when $t = 6 \text{ min}$

$$A^2 + B^2 = C^2$$

$$2A \frac{dA}{dt} + 2B \frac{dB}{dt} = 2C \frac{dC}{dt}$$

$$A \frac{dA}{dt} + B \frac{dB}{dt} = C \frac{dC}{dt}$$

$$A(40) + B(30) = C \frac{dC}{dt}$$

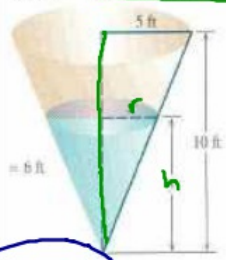
$$4(40) + 3(30) = 5 \frac{dC}{dt}$$

$$6 \text{ min} = \frac{1}{10} \text{ hr}$$

$$250 = 5 \frac{dC}{dt}$$

$$50 \text{ mph} = \frac{dC}{dt}$$

D) Water runs into a conical tank at the rate of 9 ft³/min. The tank stands point down and has a height of 10 ft and a base radius of 5 ft. How fast is the water level rising when the water is 6 ft deep?



$$\frac{dV}{dt} = 9 \text{ ft}^3/\text{min}$$

Find $\frac{dh}{dt}$ when $h = 6$

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

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

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

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

$$V = \frac{1}{3} \pi \left(\frac{1}{2} h\right)^2 h$$

$$V = \frac{1}{3} \pi \left(\frac{1}{4} h^2\right) h$$

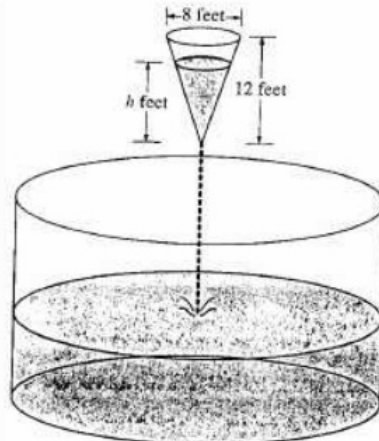
$$V = \frac{1}{12} \pi h^3$$

$$\frac{dV}{dt} = \frac{1}{4} \pi h^2 \frac{dh}{dt}$$

$$9 = \frac{1}{4} \pi (6)^2 \frac{dh}{dt}$$

$$9 = 9\pi \frac{dh}{dt}$$

21. Water is draining from a conical tank with height 12 feet and diameter 8 feet into a cylindrical tank that has a base with area 400π square feet. The depth, h , in feet, of the water in the conical tank is changing at the rate of $(h - 12)$ feet per minute. Volume of a cone: $V = \frac{1}{3}\pi r^2 h$



- A) Write an expression for the volume of water in the conical tank as a function of h .
- B) At what rate is the volume of water in the conical tank changing when $h = 3$? Indicate units of measure.
- C) Let y be the depth, in feet, of the water in the cylindrical tank. At what rate is y changing when $h = 3$? Indicate units of measure.