$ds/dt = +6 \text{ cm/s}$

3. Each side of a square is increasing at a rate of 6 cm/s. At what rate is the area of the square increasing when the area of the square is 16 cm^2?

$A = s^2 = 16 \text{ cm}^2$

$\hookrightarrow s = 4 \text{cm}$

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

$A = s^2$

$\frac{dA}{dt} = 2s\frac{ds}{dt}$

$= 2(4)6$

$= 48 \text{ cm}^2/\text{s}$

5. A cylindrical tank with radius 5 m is being filled with water at a rate of 3 m^3/min. How fast is the height of the water increasing?

$\frac{dh}{dt}$

$\frac{dV}{dt} = 3\ m^3/min$

$V = \pi r^2 h$

$V = 25\pi h$

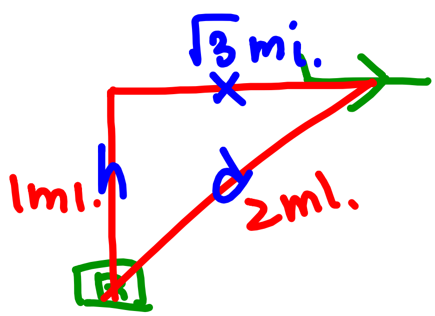
$\frac{dV}{dt} = 25\pi \frac{dh}{dt}$

$3 = 25\pi \frac{dh}{dt}$

$\frac{dh}{dt} = \frac{3}{25\pi}\ m/min$

(a) What quantities are given in the problem?
(b) What is the unknown?
(c) Draw a picture of the situation for any time t.
(d) Write an equation that relates the quantities.
(e) Finish solving the problem.

11. A plane flying horizontally at an altitude of 1 mi and a speed of 500 m/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 mi away from the station.



$$h^2 + x^2 = d^2$$

$$1^2 + x^2 = d^2$$

$$\cancel{2}x\frac{dx}{dt} = \cancel{2}d\frac{dd}{dt}$$

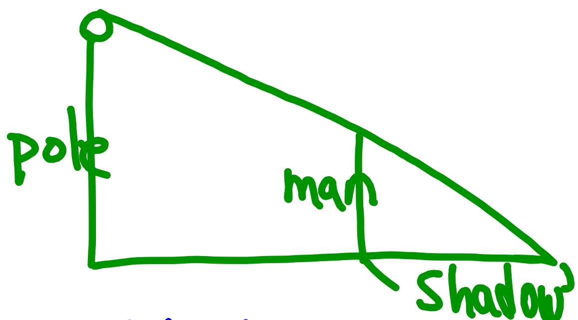
$$\sqrt{3}(500) = 2\frac{dd}{dt}$$

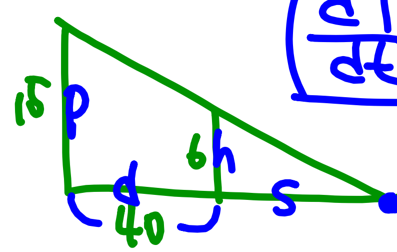
$$\frac{dd}{dt} = 250\sqrt{3}\ m/h$$

13. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. How fast is the tip of his shadow moving when he is 40 ft from the pole?

* similar Δ

$$\boxed{\frac{dT}{dt} = \frac{dd}{dt} + \frac{ds}{dt}}$$





$$\boxed{\frac{6}{s} = \frac{15}{d+s}}$$

$$6d + 6s = 15s$$

$$6d = 9s$$

$$6\frac{dd}{dt} = 9\frac{ds}{dt}$$

$$6(5) = 9\frac{ds}{dt}$$

$$\frac{10}{3} = \frac{ds}{dt}$$

$$\frac{dT}{dt} = 5 + \frac{10}{3}$$

$$= \boxed{\frac{25}{3} \text{ ft/s}}$$