

$$y = x^2 + 3$$

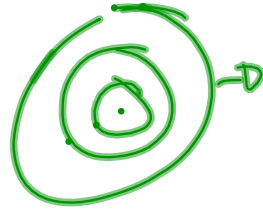
$$\frac{dx}{dt} = 2 \text{ when } x=1$$

find $\frac{dy}{dt}$ when $x=1$

$$\frac{dy}{dt} = 2x \frac{dx}{dt}$$

$$\frac{dy}{dt} = 2(1)(2) = \boxed{4}$$

ripples in pond
 radius of outercircle
 is increasing at
 a constant rate of
 4 feet, at what rate of
 Area of the disturbed water
 changing.



$$A = \pi r^2$$

$$r = 4$$

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

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

$$= 2\pi(4)(1) = \boxed{8\pi \text{ ft}^2/\text{s}}$$

Air is being pumped into a spherical balloon at a rate of 4.5 cubic inches per minute. Find the rate of change of the radius when the radius is 2 inches.

Volume \leftrightarrow Radius

$$V = \frac{4}{3} \pi r^3$$

$$4.5 = \frac{dV}{dt}$$

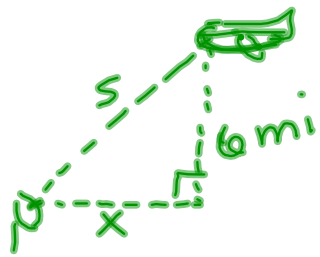
$$2 = r$$

$$\frac{dV}{dt} = \cancel{3} \left(\frac{4}{\cancel{2}} \pi \right) r^2 \frac{dr}{dt}$$

$$4.5 = 4\pi (2)^2 \frac{dr}{dt}$$

$$\frac{dr}{dt} = \frac{4.5}{16\pi} = \boxed{\frac{9}{32\pi} \text{ in/min}}$$

An Airplane is flying on a flight path that will take it directly over a radar tracking station. If s is decreasing at a rate of 400 miles per hour when $s = 10$ miles, what is the speed of the plane?



$$\text{speed} = \frac{dx}{dt}$$

$$\frac{ds}{dt} = -400 \text{ mi/hr}$$

$$x^2 + 6^2 = s^2$$

$$s = 10$$

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

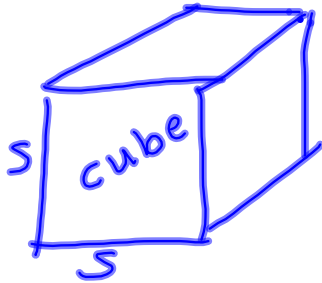
$$x^2 + 36 = 100$$

$$x^2 = 64$$

$$2x \frac{dx}{dt} = 2(10)(-400) \quad x = 8$$

$$\frac{dx}{dt} = \frac{-4000}{x}$$

$$\frac{dx}{dt} = \frac{-4000}{8} = \boxed{-500 \text{ mph}}$$



surface area is changing @
53 cm²/s

how quickly ~~is~~ the sides
are of the cube changing when
they are 10cm

$$10\text{cm} = s$$

$$53 = \frac{dSA}{dt}$$

$$SA = 6s^2$$

$$\frac{dSA}{dt} = 12s \frac{ds}{dt}$$

$$\frac{53}{12} =$$

$$4.42 = \frac{10}{s} \frac{ds}{dt}$$

$$\frac{ds}{dt} = 0.44 \text{ cm/s}$$