Related rates day 1

Friday, October 20, 2017 8:26 AM

Pebble in pond.

concentric circles growing

Area is growing r is growing.

Q: How fast is Area changing

(aka rate of change of area, aka $\frac{dA}{dt}$)

when $r = 10$ in if the radius is growing 1 inch per minute?

A:

$$A = \pi r^2$$

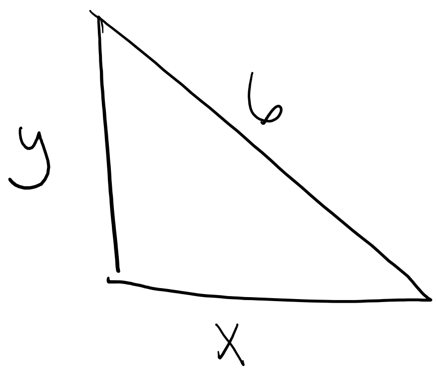
$$\frac{dA}{dt} = \pi \left[2r \frac{dr}{dt} \right]$$

$$\frac{dr}{dt} = 1 \text{ in/min}$$

$$r = 10 \text{ in.}$$

$$\frac{dA}{dt} = \pi\left[2 \cdot 10\text{ in} \cdot 1\text{ in}/\text{min}\right]$$

$$= 20\pi \frac{\text{in}^2}{\text{min}}$$



find y' when $y = 1$.

Know $x' = \frac{1}{2}$ m/sec

$$x^2 + y^2 = 36 \implies \begin{aligned} x^2 + 1 &= 36 \\ x^2 &= 35 \\ x &= \sqrt{35} \end{aligned}$$

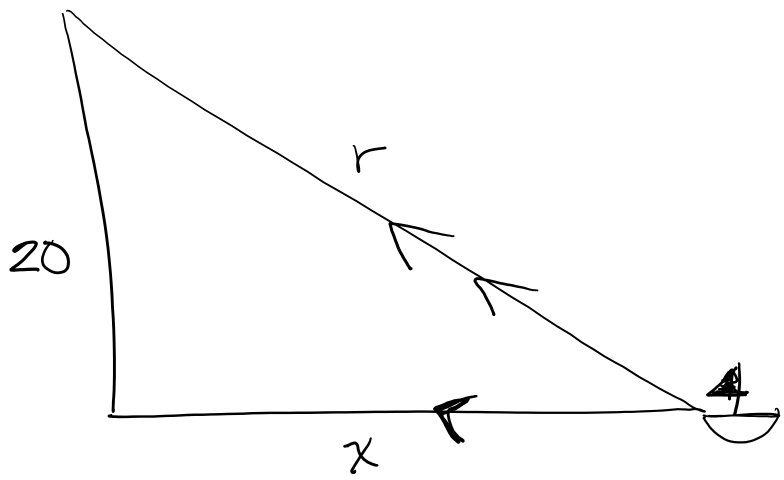
$$2x \cdot \frac{dx}{dt} + 2y\frac{dy}{dt} = 0$$

manufacture

$$2\sqrt{35}\,(.5) + 2\frac{dy}{dt} = 0$$

$$\sqrt{35} = -2\frac{dy}{dt}$$

$$\frac{\sqrt{35}}{-2}\text{ m/sec} = \frac{dy}{dt} \implies -2.958$$



How fast is distance from dock changing when Rope = 30 ft. long.

$dr/dt = -2$ ft/sec.

$$20^2 + x^2 = r^2 \Longrightarrow 20^2 + x^2 = 30^2$$

$$x^2 = 500$$

$$x = \sqrt{500}$$

$$0 + 2x\frac{dx}{dt} = 2r\frac{dr}{dt}$$

$$2(\sqrt{500})\frac{dx}{dt} = 2(30)(-2\text{ft}/\text{sec})$$

$$\frac{dx}{dt} = \frac{2(30)(-2)}{2\sqrt{500}}\ \text{ft}/\text{sec}$$

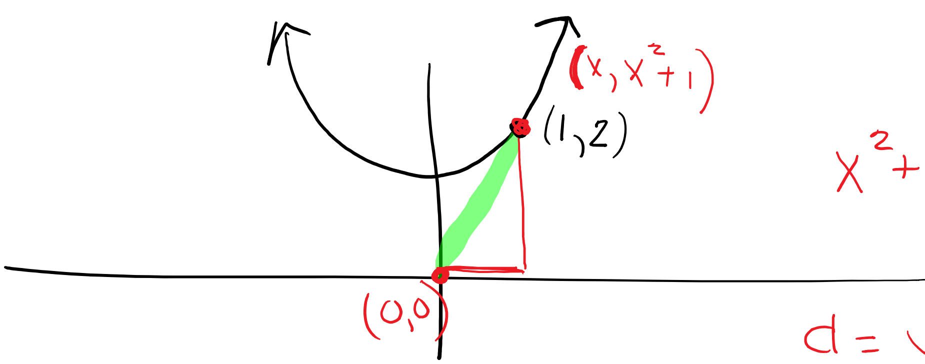
$$= \frac{-60}{\sqrt{500}}\ \text{ft}/\text{sec}$$

$$=$$

$= -2.683$ ft/sec

The graph $y = x^2 + 1$.

Q: How fast is the distance from a point on the graph to the origin changing when $x = 1$ and $\frac{dx}{dt} = 5$ m/sec.



$x^2 + y^2 = h^2$

$$d = \sqrt{(x_1 - x_0)^2 + (y_1 - y_0)^2}$$

$$= \sqrt{(1-0)^2 + (2-0)^2}$$

$$= \sqrt{5}$$

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

$$2 d d' = 2x \cdot \frac{dx}{dt} + 2(x^2+1)\left(2x \frac{dx}{dt}\right) \quad \text{or: } 2 \sqrt{5}\ 1$$

$$\cancel{2}\sqrt{5}\, d' = \cancel{2} \cdot 5 + \cancel{2}(2)(2 \cdot 5)$$

$= 11.18 \text{ m/sec}$

2.6 5, 7, 8, 13 - 20