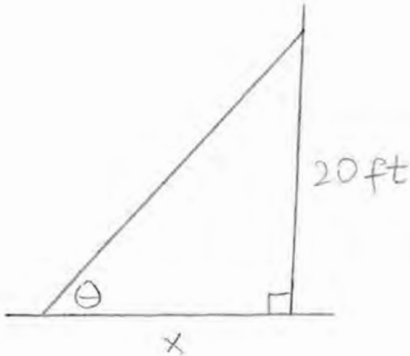
[2]



$$\left.\frac{dA}{dt}\right|_{x=15ft} = -5\ \frac{ft^2}{sec}$$

WANT $\left.\dfrac{d\theta}{dt}\right|_{x=15ft}$

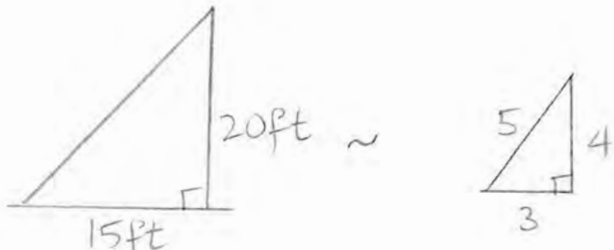
$$\cot\theta = \frac{x}{20ft}$$

$$x = 20\cot\theta\ ft$$

$$A = \tfrac{1}{2}(20ft)(20\cot\theta\ ft)$$

12 $$\underline{A = 200\cot\theta\ ft^2}$$

8 $$\underline{\frac{dA}{dt} = -200\csc^2\theta\ \frac{d\theta}{dt}\ ft^2}$$



5 $$\underline{\cancel{-5}\ \frac{ft^2}{sec}} = \overset{40}{\cancel{-200}}\left(\boxed{\frac{5}{4}}\right)^2 \left.\frac{d\theta}{dt}\right|_{x=15ft} ft^2$$ 5

$$\frac{1}{\underset{5}{\cancel{40}}}\ \frac{\overset{2}{\cancel{16}}}{25}\ \frac{1}{sec} = \left.\frac{d\theta}{dt}\right|_{x=15ft}$$

$$\left.\frac{d\theta}{dt}\right|_{x=15ft} = \underline{\frac{2}{125}\ \frac{\text{RADIANS}}{\text{SEC}}}$$ 5

THE ANGLE IS <u>GROWING</u> 3 BY $\frac{2}{125}$ RADIANS PER SECOND.

[3]. $\frac{d}{dx} x^3y^2 = \frac{d}{dx} c$

$$\underline{3x^2y^2 + 2x^3y\frac{dy}{dx} = 0} \quad 8$$

$$\frac{dy}{dx} = -\frac{3x^2y^2}{2x^3y} = \underline{-\frac{3y}{2x}} \quad 3$$

$\frac{d}{dx}(2x^2 - 3y^2) = \frac{d}{dx} k$

$$\underline{4x - 6y\frac{dy}{dx} = 0} \quad 5$$

$$\frac{dy}{dx} = \frac{4x}{6y} = \underline{\frac{2x}{3y}} \quad 3$$

DERIVATIVES / SLOPES ARE <u>NEGATIVE RECIPROCALS</u> 3
SO CURVES ARE PERPENDICULAR AT INTERSECTIONS

[4] [a] $f'(x) = \underline{\frac{1}{1+(\sqrt{x})^2}}\ 3 \quad \underline{\frac{1}{2\sqrt{x}}}\ 3 \longrightarrow f'(3) = \frac{1}{1+3} \cdot \frac{1}{2\sqrt{3}} = \underline{\frac{1}{8\sqrt{3}}}\ 3$

$dx = 3.4 - 3 = \underline{0.4}\ 1\frac{1}{2}$

$dy = f'(3)\,dx = \underline{\frac{1}{\cancel{8}_{4}\sqrt{3}} \cdot \frac{\cancel{2}}{5}}\ 3 = \underline{\frac{1}{20\sqrt{3}}}\ 1\frac{1}{2}$

[b] $f(3) = \arctan\sqrt{3} = \frac{\pi}{3}$

$f(3.4) \approx f(3) + dy = \frac{\pi}{3} + \frac{1}{20\sqrt{3}}$

3 3

[5][a] $\frac{d}{dx} \arccos x^2 = -\frac{1}{\sqrt{1-(x^2)^2}} \cdot 2x = \boxed{-\frac{2x}{\sqrt{1-x^4}}}$ 3 3 3

$\frac{d^2}{dx^2} \arccos x^2 = -\frac{2\sqrt{1-x^4} - \cancel{2}x \frac{1}{\cancel{2}\sqrt{1-x^4}}(-4x^3)}{1-x^4}$ $1\frac{1}{2}$ 5 3

$= -\frac{2(1-x^4)+4x^4}{(1-x^4)^{\frac{3}{2}}} = -\frac{2x^4+2}{(1-x^4)^{\frac{3}{2}}}$ 8

[b] $y = (1+\ln x)^{\sqrt{x}}$

$$5 \quad \ln y = \sqrt{x}\,\ln(1+\ln x)$$

$$3 \quad \frac{1}{y}\frac{dy}{dx} = 3 \quad \frac{1}{2\sqrt{x}}\ln(1+\ln x) + \cancel{\sqrt{x}}\,\frac{1}{1+\ln x}\,\frac{1}{\cancel{x}\sqrt{x}} \quad 5$$

$$\frac{1}{y}\frac{dy}{dx} = \frac{(1+\ln x)\ln(1+\ln x)+2}{2\sqrt{x}(1+\ln x)} \quad 5$$

$$\frac{dy}{dx} = \frac{(1+\ln x)^{\sqrt{x}-1}\left[(1+\ln x)\ln(1+\ln x)+2\right]}{2\sqrt{x}} \quad 3$$

[6][a] $(x^2+xy^2)^3 = 4+4\sec(x+y)$ 3

$$3\ \ 3(x^2+xy^2)^2\left(2x+y^2+x(2y)\frac{dy}{dx}\right)\ \ 8$$

$$= 5\ \ 4\sec(x+y)\tan(x+y)\left(1+\frac{dy}{dx}\right)\ \ 5$$

$$\boxed{\begin{aligned}&3\left(1^2+1(-1)^2\right)^2\left(2(1)+(-1)^2+1(2(-1))\left.\frac{dy}{dx}\right|_{(1,-1)}\right)\\ &\quad = \cancel{4\sec(1+(-1))\tan(\underbrace{1+(-1)}_{0})\left(1+\left.\frac{dy}{dx}\right|_{(1,-1)}\right)}\end{aligned}}\ \ 8$$

$$\underbrace{}_{0}$$

$$\cancel{3(4)}\left(3-2\left.\frac{dy}{dx}\right|_{(1,-1)}\right)=0$$

$$\left.\frac{dy}{dx}\right|_{(1,-1)} = \frac{3}{2}\ \ 5$$

$$y - -1 = \frac{3}{2}(x-1)$$

$$y+1 = \frac{3}{2}(x-1)\ \ 3$$

[b] $y \approx -1 + \frac{3}{2}(x-1)$ FOR $x \approx 1$

$y \approx \underline{-1 + \frac{3}{2}(1.1-1)}$ 5

$= -1 + \frac{3}{2}\frac{1}{10}$

$= -1 + \frac{3}{20}$

$= \underline{-\frac{17}{20}}$ $1\frac{1}{2}$