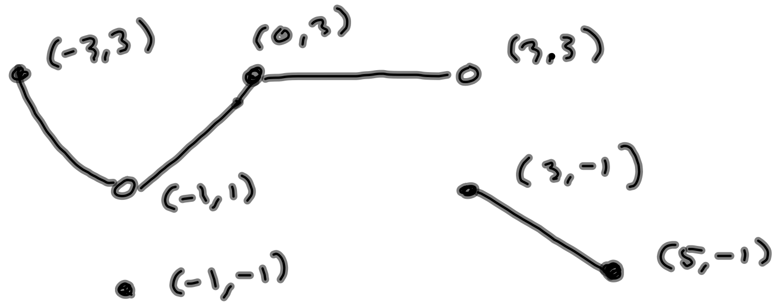


(a) Not cnt^{s} @ $x=-1$

$\lim_{x \to -1} f(x) = 1 \neq -1 = f(-1)$

(b) No. $\lim_{x \to 3^-} f(x) = 3 \neq -1 = \lim_{x \to 3^+} f(x)$

(c) $\lim_{x \to -1} f(x) = 1$

(d) Define $f(-1) = 1$ to make it cnt^{s} @ $x=-1$.

Prove $\lim_{x \to 3} (3x+7) = 16$.

Proof Let $\varepsilon > 0$ be given. Define $\delta = \frac{\varepsilon}{3}$.

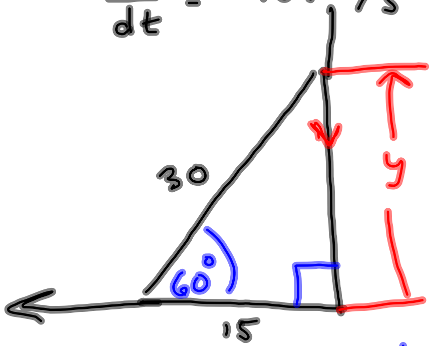
Then $0 < |x-3| < \delta$ implies

$|(3x+7)-16| = |3x-9| = 3|x-3| < 3\delta = 3 \cdot \frac{\varepsilon}{3} = \varepsilon$ ■

Ladder falling

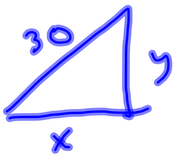
$\frac{dy}{dt} = -10\,ft/s$

30-ft ladder



$y = 15\sqrt{3}$

How fast is the bottom sliding away from the wall, when it's 15 feet away?



want $\frac{dx}{dt}$, given $\boxed{\frac{dy}{dt} = -10}$

* $x^2 + y^2 = 30^2$ *

$$y(x(t)) = y = \sqrt{30^2 - x^2} = y(x(t)) = \sqrt{30^2 - (x(t))^2}$$

$$\frac{dy}{dt} = \underbrace{\frac{1}{2}(900 - x^2)^{-\frac{1}{2}}(\cancel{2}x)}_{\frac{dy}{dx}} \frac{dx}{dt}$$

Chain rule says $\frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt}$

$$\left.\frac{dy}{dt}\right|_{x=15} = \frac{1}{2}\left(900 - 15^2\right)^{-\frac{1}{2}}\left(-2(15)\right)\left.\frac{dx}{dt}\right|_{x=15} = -10$$

$$= -\frac{1}{2}\left(\frac{1}{\sqrt{675}}\right)(30)\left.\frac{dx}{dt}\right|_{x=15} = -10$$

$$\begin{array}{r|l} 3 & 675 \\ 3 & 225 \\ 3 & 75 \\ 5 & 25 \\ & 5 \end{array}$$

$$= -15\left(\frac{1}{15\sqrt{3}}\right)\left.\frac{dx}{dt}\right|_{x=15} = -10$$

$$\frac{1}{\sqrt{3}}\frac{dx}{dt} = +10$$

$$\frac{dx}{dt} = +10\sqrt{3}$$

Implicit Differen-tiation.

$$\frac{d}{dt}\left[x^2 + y^2 = 30^2\right]$$

$$x' = \frac{dx}{dt}$$

$$y' = \frac{dy}{dt}$$

$$2xx' + 2yy' = 0$$

$$xx' = -yy'$$

$$x' = -\frac{yy'}{x} = -\frac{15\sqrt{3}\cdot(-10)}{15} = 10\sqrt{3}$$

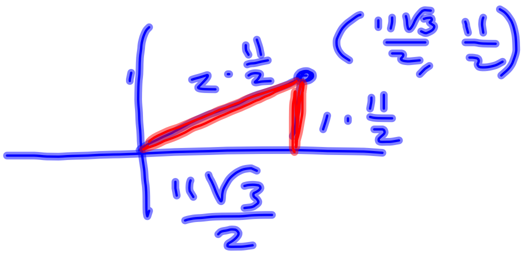
Find an equation of the tangent to a circle of radius 11 @ $\left(\frac{11\sqrt{3}}{2}, \frac{11}{2}\right)$

$$\frac{d}{dx}\left[x^2 + y^2 = 11^2\right]$$

$$2x + 2y y' = 0$$

$$y' = -\frac{x}{y}$$

$$= -\frac{\frac{11\sqrt{3}}{2}}{\frac{11}{2}} = -\frac{11\sqrt{3}}{11} = \sqrt{3}$$

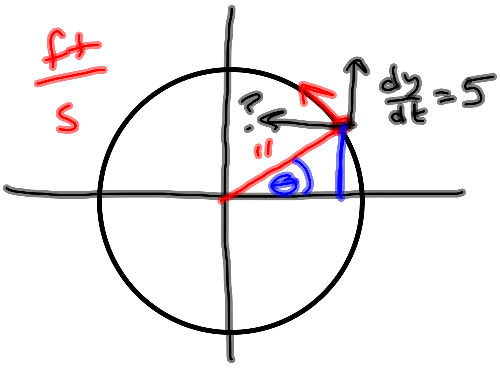


$$y = -\sqrt{3}\left(x - \frac{11\sqrt{3}}{2}\right) + \frac{11}{2}$$

$$y = f'(a)(x-a) + f(a)$$

$$\frac{f(x+h) - f(x)}{h} \qquad y = \left.\frac{dy}{dx}\right|_{x=a} (x-a) + \left.y\right|_{x=a}$$

$\frac{dy}{dt}$ $\frac{ft}{s}$



when $(x,y) = \left(\frac{11\sqrt{3}}{2}, \frac{11}{2}\right)$, we know that $\frac{dy}{dt} = 5$. Find the rate at which it's moving to the left.

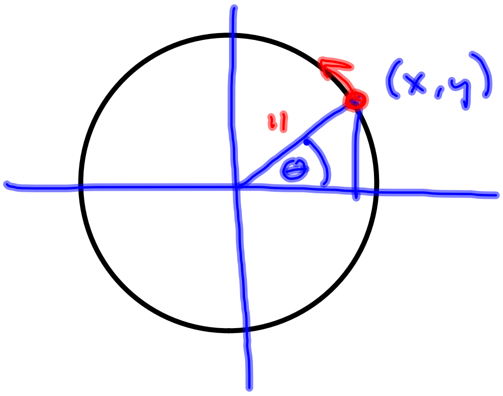
$$\frac{d}{dt}\left[x^2+y^2=11^2\right]$$

$$2x\,x' + 2y\,y' = 0$$

$$\frac{dx}{dt} = x' = -\frac{y}{x}y'$$

$$= -\frac{\frac{11\sqrt{3}}{2}}{\frac{11}{2}}\cdot 5 = 5\sqrt{3}$$

Nov 29-12:45 PM



$(x, y) = \left(\frac{11\sqrt{3}}{2}, \frac{11}{2}\right)$

$\frac{dy}{dt} = 5$

$x = 11\cos\theta$

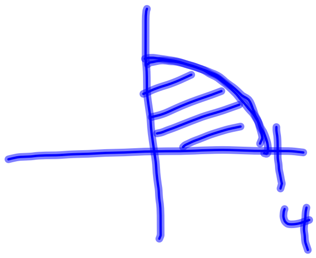
$\frac{y}{11} = \sin\theta$

$y = 11\sin\theta$

$\frac{dy}{dt} = -11\cos\theta\,\frac{d\theta}{dt}$ SET 5

$\frac{dx}{dt} = 11\sin\theta\,\frac{d\theta}{dt}$

$4\,\boxed{\pi\int_0^4 \sqrt{16-x^2}\,dx}$



$y = \sqrt{16-x^2}$

$x^2 + y^2 = 16 = 4^2$