§10.1
#8

$x = \sin t \quad , \quad y = 1 - \cos t$

$x^2 = \sin^2 t \qquad y - 1 = -\cos t$

$1 - y = \cos t$

$(y-1)^2 = \cos^2 t$

$x^2 + (y-1)^2 = \sin^2 t + \cos^2 t = 1$

circle of radius $r = 1$ centered at $(h, k) = (0, 1)$

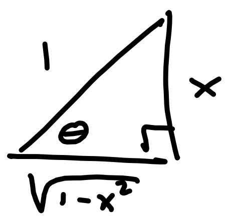
$$(x-h)^2 + (y-k)^2 = r^2$$

$t = \arcsin(x)$

$y = 1 - \cos(\underbrace{\arcsin(x)}_{\theta})$

$y = 1 - \sqrt{1 - x^2}$

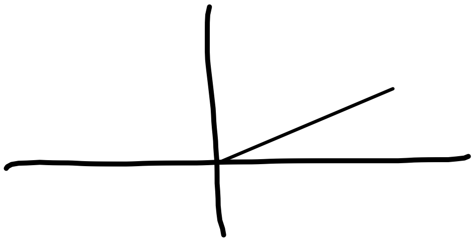
is the bottom $\frac{1}{2}$ of the circle in question.



#19 $x = 2\cos \pi t + 5$ $1 \le t \le 2$

$y = 2\sin \pi t + 3$

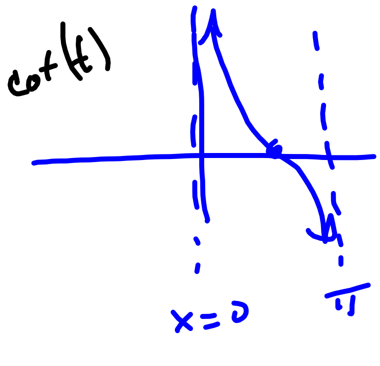
Find motion of particle in the plane.

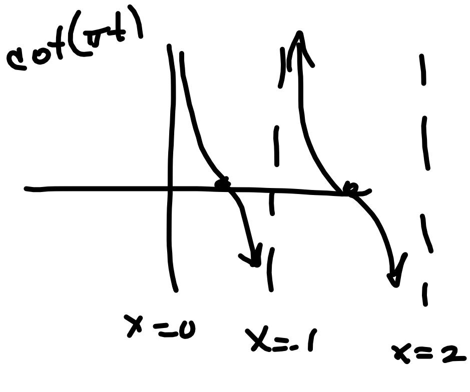


$$\frac{dy}{dt} = -2\pi \cos \pi t$$

$$\frac{dx}{dt} = 2\pi \sin \frac{\pi}{t}$$

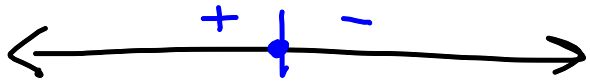
$$\frac{dy}{dx} = \frac{-2\pi \cos \pi t}{2\pi \sin \pi t} = -\cot(\pi t) \text{ SET } 0 \Rightarrow t = 1.5$$





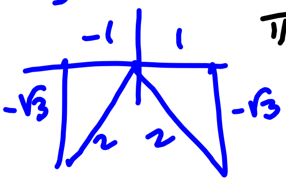
$t = 1.5 \Rightarrow y' = 0$

$y'(x)$



$2\cos\frac{4\pi}{3} + 5$

t	x	y
1	$-2+5$	3
$\frac{4}{3}$	$-\frac{1}{2}+5$	$-\frac{\sqrt{3}}{2}+3$
$\frac{5}{3}$	$\frac{1}{2}+5$	



$\pi t = \frac{\pi}{3}$

$t = \frac{1}{3}$

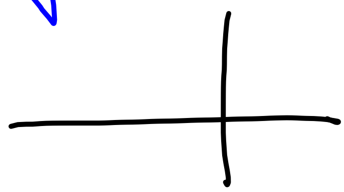
$\pi t = \frac{2\pi}{3}$

$t = \frac{2}{3}$

$\pi t = \frac{4\pi}{3}$

$t = \frac{4}{3}$

$t = \frac{5}{3}$ $\frac{5\pi}{3}$



$y = 2\sin \pi t + 3$

$y(1) = 2\sin \pi + 3$

$y(4/3) = 2\sin \frac{4\pi}{3}$

#19 $x = 2\cos \pi t + 5$

$y = 2\sin \pi t + 3$

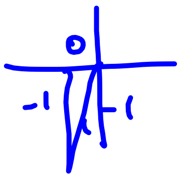
$\frac{dy}{dx} = 0$ @ $t = 1.5 = \frac{3}{2}$

$x\left(\frac{3}{2}\right) = 2\cos\left(\frac{3\pi}{2}\right) + 5$

$= 5$

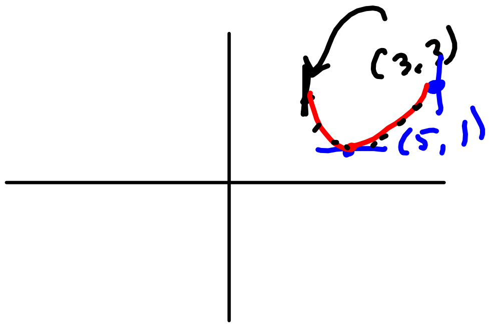
$y\left(\frac{3}{2}\right) = 2\sin \frac{3\pi}{2} + 3 = 1$

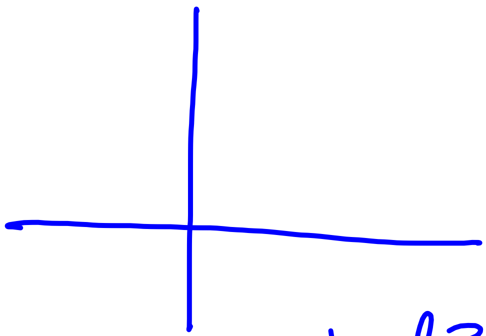
$\frac{dy}{dt} = -2\pi \cos \pi t$



$\frac{dx}{dt} = 2\pi \sin(\pi t)$

$\frac{dy}{dx} = \frac{-2\pi \cos \pi t}{2\pi \sin \pi t} = -\cot(\pi t)$





where's it vertical?

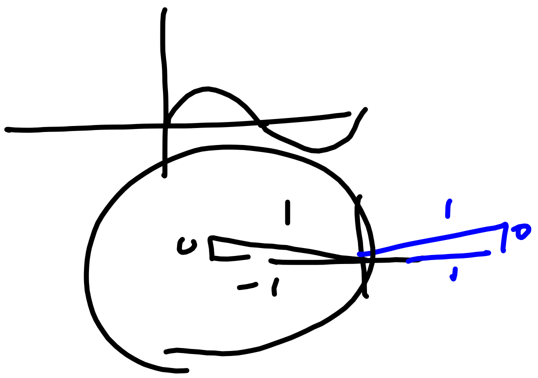
$\frac{dx}{dt} = 0$ ($\&$ $\frac{dy}{dt} \neq 0$)

$2\pi \sin(\pi t) = 0$

$\sin(\pi t) = 0$

$\pi t = 0, \pi, 2\pi$

$t = 0, 1, 2$



$x(1) = 2\cos(\pi) + 5 =$

$= -2 + 5 = 3$

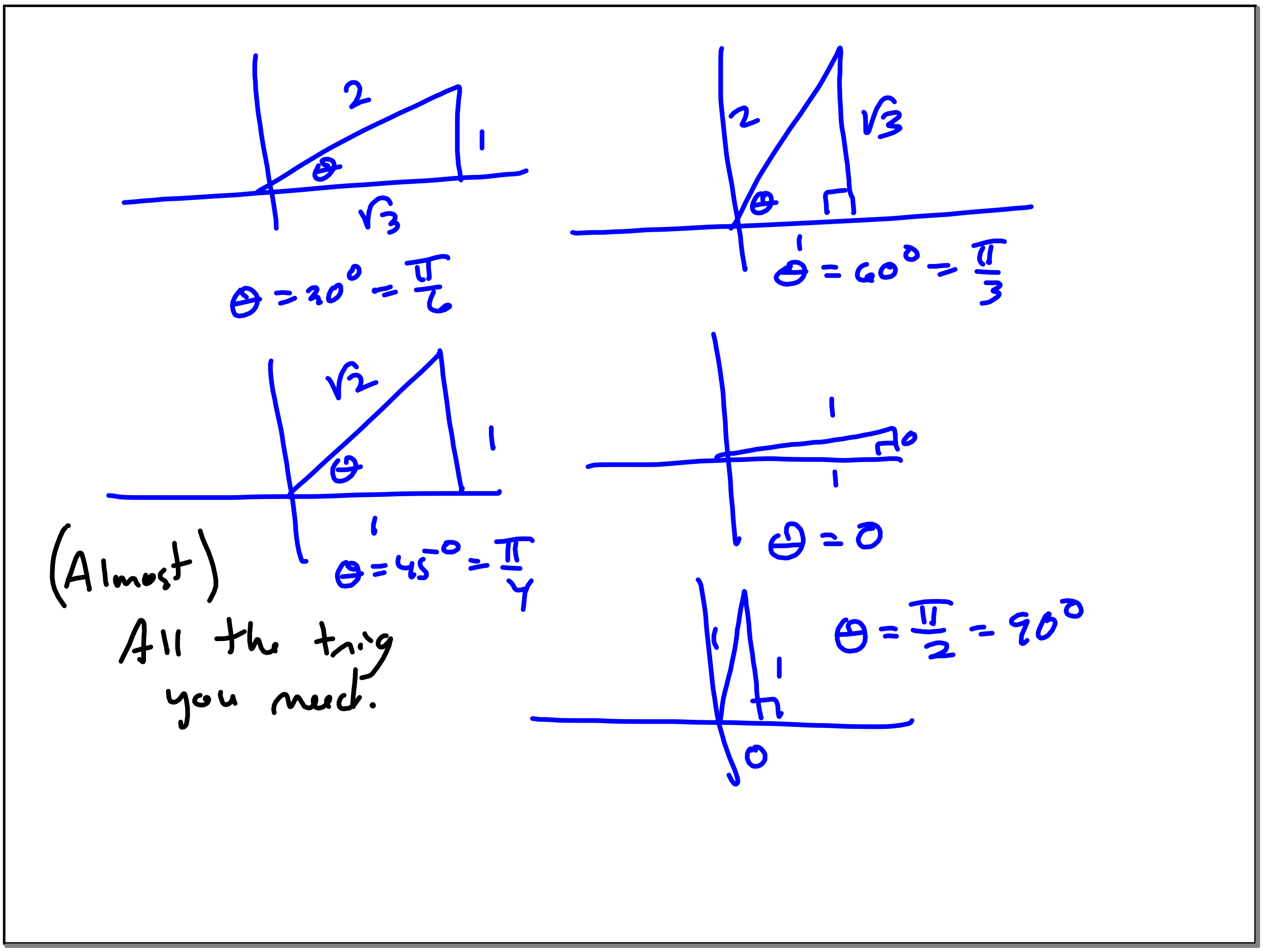
$y(1) = 2\sin \pi + 3 = 3$

$(x(1), y(1)) = (3, 3)$

$x(2) = 2\cos(2\pi) + 5 = 7$

$y(2) = 2\sin(2\pi) + 3 = 3$

$(x(2), y(2)) = (7, 3)$

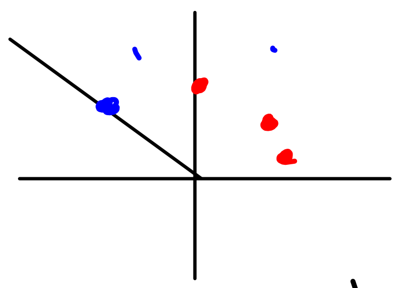

2
1
√3
θ = 30° = π/6
2
√3
1
θ = 60° = π/3
√2
1
1
θ = 45° = π/4
1
1
θ = 0
(Almost)
All the trig
you need.
1
1
0
θ = π/2 = 90°

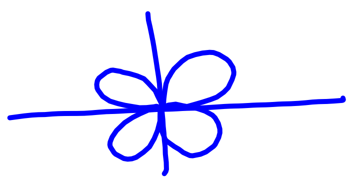
Polar coords : given an angle Θ
& a distance r from the origin.

Pretty slick for roundish stuff

$r = f(\theta)$

$r = 1$ is the unit circle!





$r = \sin(4t)$