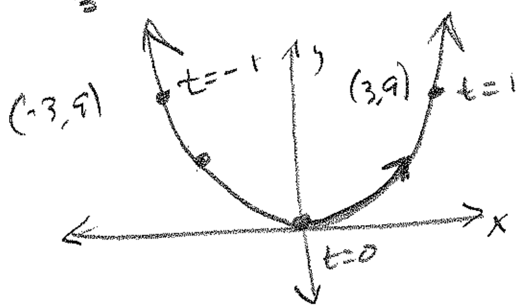
202 §11.1 #s 1, 4, 7, 10, 13, 16, 20

#s 1-18 Identify path by eliminating parameter. Label the ~~t~~ curve to indicate the particle's path.

(1) $x = 3t \quad y = 9t^2 \Longrightarrow$

$\frac{x}{3} = t \Longrightarrow y = 9\left(\frac{x}{3}\right)^2 = x^2$ parabola



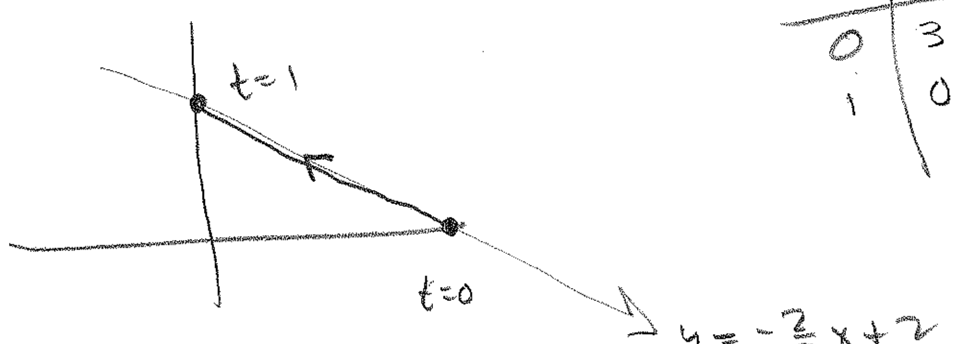
t	x	y
-2	-6	36
-1	-3	9
0	0	0
1	3	9
2	6	36

(4) $x = 3 - 3t, \; y = 2t \quad 0 \le t \le 1$

$-3t = x - 3$

$t = \frac{3-x}{3} \Longrightarrow y = 2\left(\frac{3-x}{3}\right) = 2\left(1 - \frac{1}{3}x\right) = -\frac{2}{3}x + 2$

t	x	y
0	3	0
1	0	2

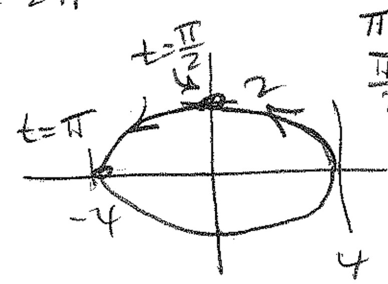


(7) $x = 4\cos t, \; y = 2\sin t \quad 0 \le t \le 2\pi$

t	x	y
0	4	0
π	-4	0
$\frac{\pi}{2}$	0	2

$\frac{x}{4} = \cos t \qquad \frac{y}{2} = \sin t$

$\left(\frac{x}{4}\right)^2 + \left(\frac{y}{2}\right)^2 = \frac{x^2}{4^2} + \frac{y^2}{2^2} = 1$



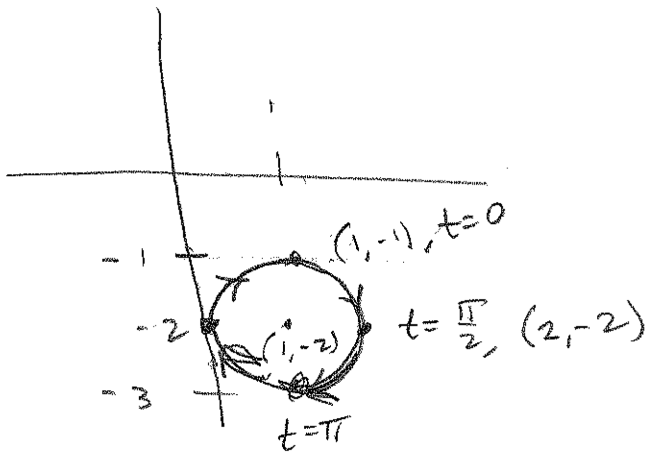
202 §11.1 #s 10, 13, 16, 20

(10) $x = 1 + \sin t, \quad y = \cos t - 2 \quad 0 \le t \le \pi$

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

$(x-1)^2 + (y+2)^2 = 1$ circle $r = 1$

$(h, k) = (1, -2)$

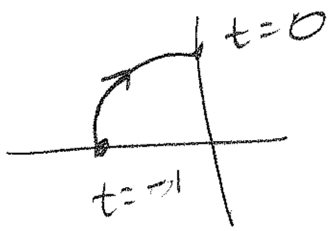


t	x	y
0	1	-1
$\frac{\pi}{2}$	2	-2
π	1	-3
$\frac{3\pi}{2}$	0	-2

(13) $x = t, \quad y = \sqrt{1 - t^2} \quad -1 \le t \le 0$

$y = \sqrt{1 - x^2} \qquad -1 \le x \le 0$

quarter circle in QII



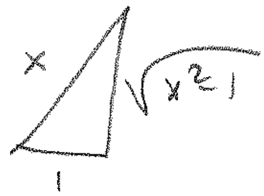
t	x	y
-1	-1	0
0	0	1

202 §11.1 #s 16, 20

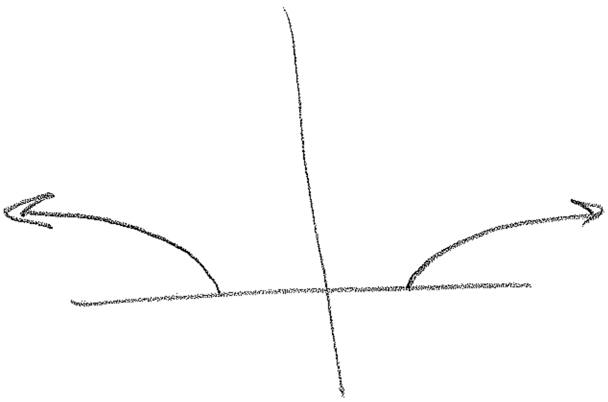
(16) $x = -\sec t$, $y = \tan t$ $-\frac{\pi}{2} < t < \frac{\pi}{2}$

$\sec t = -x$

$t = \text{arcsec}(-x) \implies y = \tan(\text{arcsec}(-x)) = \tan(\text{arcsec}(x))$



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



Didn't handle the $-x$ or SOMEthing, correctly.

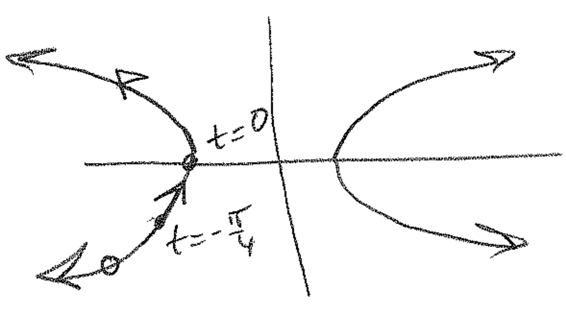
secant & tangent. Hmmmmmm

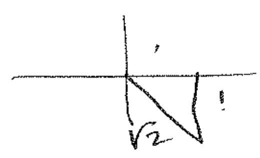
$\sec^2 t = \tan^2 t + 1$

$\sec^2 t - \tan^2 t = 1$

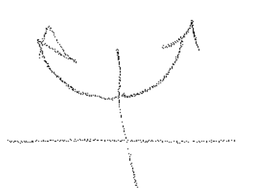
$x^2 - y^2 = 1$ $\rightarrow y = \pm\sqrt{x^2-1}$

t	x	y
$-\frac{\pi}{4}$	$-\sqrt{2}$	1
0	1	0





Somehow, between $\pm\frac{\pi}{4}$ & $\pm\frac{\pi}{2}$, we manage to race the entire left sheet of the hyperbola.



202 §11.1 # 20

(20) Find parametric eqns & parametric interval for a particle that starts @ (a,0) & traces the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Keep $\theta \in [0, 2\pi]$. (you can also adjust the interval)

(a) once clockwise

$\frac{x^2}{a^2} = \cos^2 \theta$

$x^2 = a^2 \cos^2 \theta$

could come from

$x = a\cos\theta$ once around

$\boxed{\begin{array}{l} x = a\cos\theta \\ y = b\sin\theta \end{array}}$

~~Nope. That's counter clockwise~~ Replace θ by $-\theta$.

~~(b)~~

$x = a\cos(-\theta)$, $y = b\sin(-\theta)$

$= \boxed{a\cos\theta, \quad y = -b\sin\theta}$

(b) once counterclockwise: $\boxed{\begin{array}{l} x = a\cos\theta \\ y = b\sin\theta \end{array}}$

(c) twice clockwise: $x = a\cos(2\theta)$ $y = -b\sin(2\theta)$

OR Let $t \in [0, 4\pi]$ & use (a)

(d) twice counterclockwise: $\boxed{x = a\cos(2\theta), y = b\sin(2\theta)}$

OR use (b) & $t \in [0, 2\pi]$