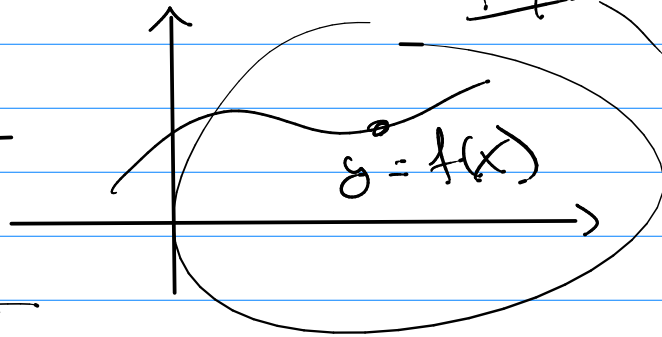


Math 293

(ex) $x = 3\sin t, y = 3\cos t, 0 \leq t \leq \pi$

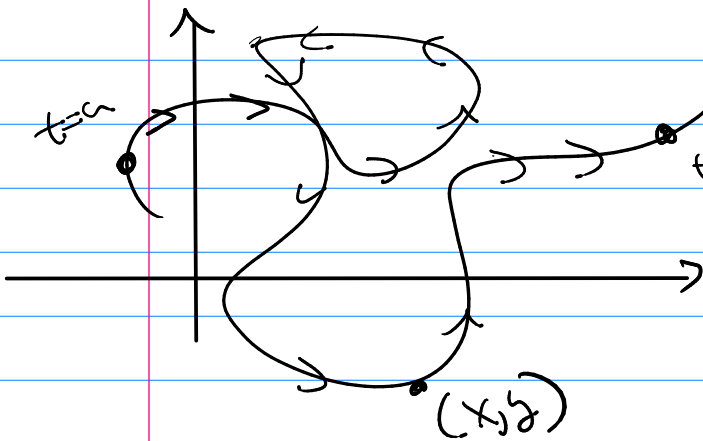
Parametric Curves

Calc 1 to 2 (up to now)



to xy^k → change?
 → Deriv's
 → Sols?
 → def. integrals

Parametric Curves



$x(t)$
 $y(t)$ Parametric eqns

t : parameter
 $a \leq t \leq b$

New way = Parametric curves

do calculus stuff → change?
 - Derivative
 → Sols?
 - def integrals

(1) given a parametric eqn → $y = f(x)$ like we are used to

(ex) $x = 3\sin t, y = 3\cos t, 0 \leq t \leq \pi$

t 's, $x(t), y(t)$ → $y = f(x)$ - implicit or explicit

(ex) $x = 3\sqrt{t} + 1$ $y = \cos(t)$

↓

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

↗

so $y = \cos\left(\left(\frac{x-1}{3}\right)^2\right)$

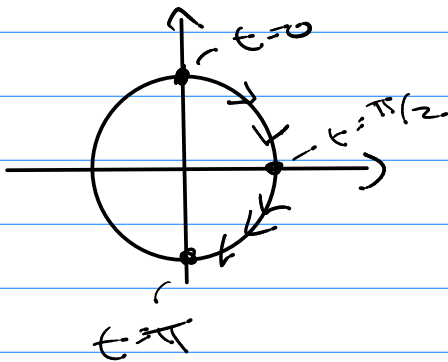
(ex) $x = 3\sin t$, $y = 3\cos t$, $0 \leq t \leq \pi$

$\sin t = \frac{x}{3}$

$\frac{3}{\sin t} \mid x \rightarrow \cos t = \frac{\sqrt{9-x^2}}{3}$

so $y = \sqrt{9-x^2}$

$x^2 + y^2 = (3)^2$



(ex) $x = 3\sin t$, $y = 3\cos t$, $0 \leq t \leq \pi$

try: $(3\sin t)^2 + (3\cos t)^2 = x^2 + y^2$

$9\sin^2 t + 9\cos^2 t = x^2 + y^2$

$9(\sin^2 t + \cos^2 t) = x^2 + y^2$

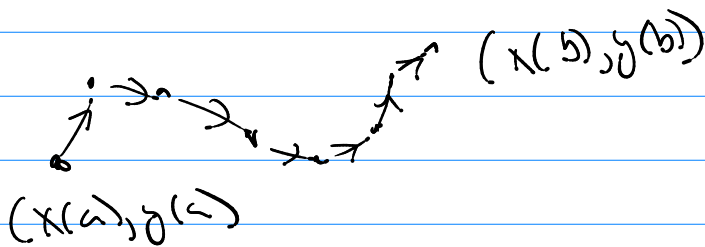
$9 = x^2 + y^2$

10.1 (1) Parametric $\rightarrow y = f(x)$

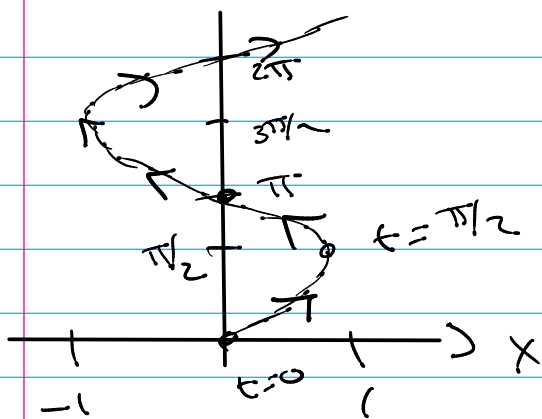
(2) graph

a) table of values.

t	$x(t)$	$y(t)$
a	$x(a)$	$y(a)$ ← initial point
\vdots		
b	$x(b)$	$y(b)$ ← terminal point

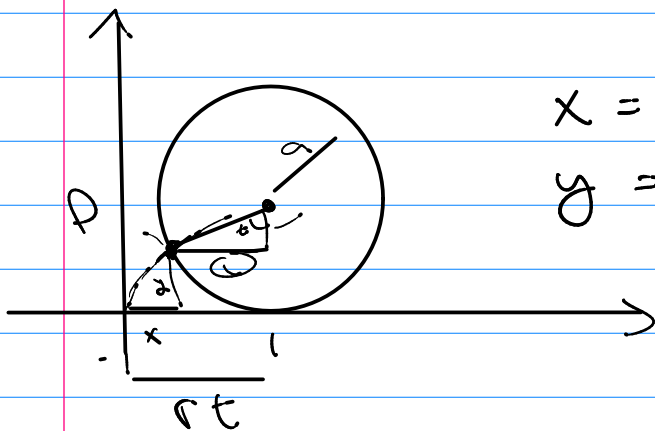


(2x) $x(t) = \sin t$ $y(t) = t$ $t \in [0, 4\pi]$



b) technology

(see video)

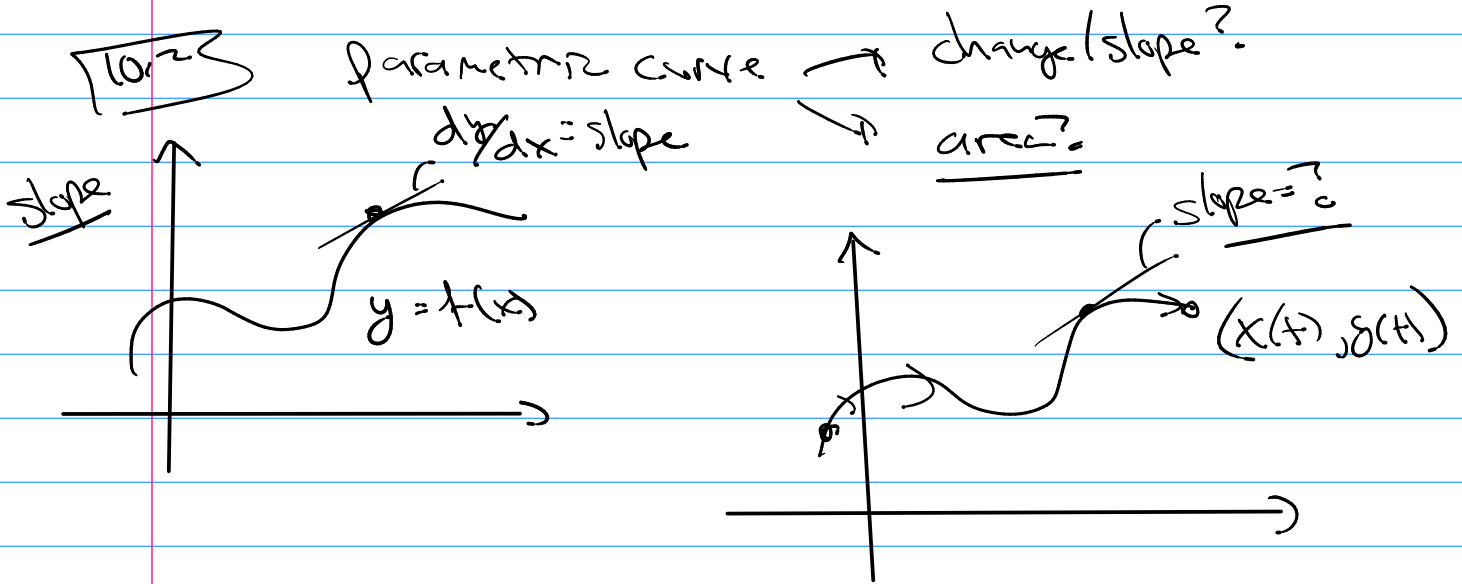
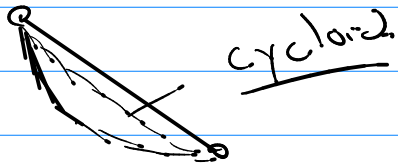
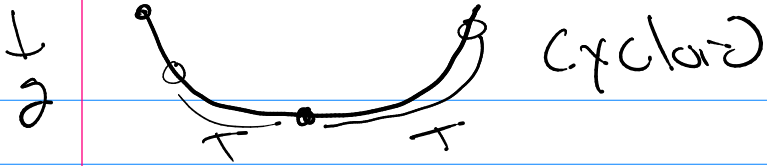


$$x = rt - a \sin t$$

$$y = a - a \cos t$$

Cycloid





chain rule: $f(x) = f(x(t)) = y(x(t))$

$$\frac{d}{dt} [y(x(t))] = \frac{dy}{dx} \cdot \frac{dx}{dt}$$

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt}$$

