MATH 122

PARAMETRIC CURVES

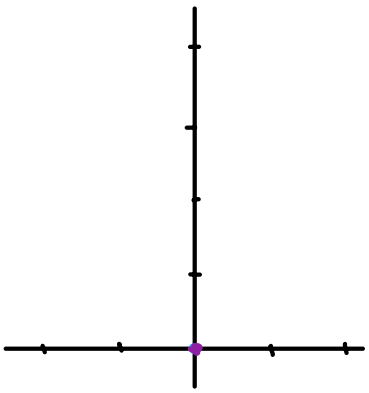
GOALS

- ☐ IDENTIFY CURVES AND THEIR ORIENTATION FROM PARAMETRIC EQUATIONS
- ☐ ELIMINATE THE PARAMETER
- ☐ COMPUTE $\frac{dy}{dx}$ AND $\frac{d^2y}{dx^2}$ FROM PARAMETRIC EQUATIONS
- ☐ FIND AN EQUATION FOR THE LINE TANGENT TO A PARAMETRIC CURVE AT $t = t_0$

e.g.

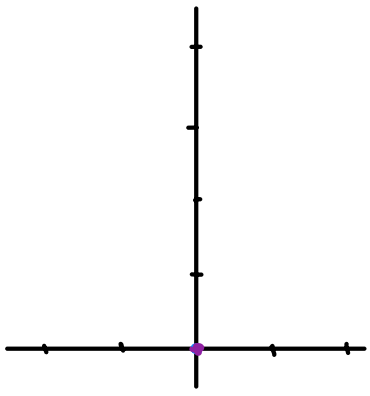
$$\begin{cases} x = t \\ y = t^2 \end{cases}$$

t	(x,y)



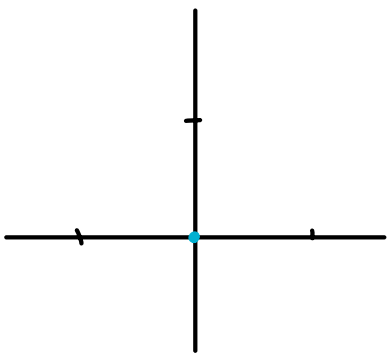
$$\begin{cases} x = -2t \\ y = 4t^2 \end{cases}$$

t	(x,y)



Bonus:

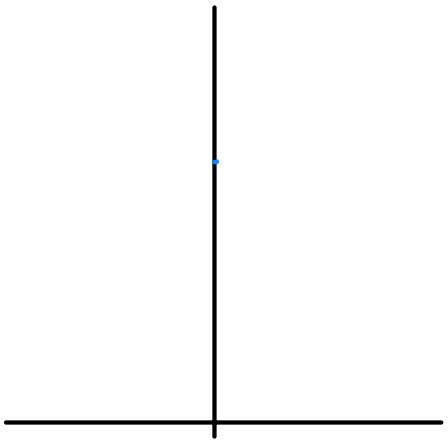
$$\begin{cases} x = \sin t \\ y = \sin^2 t \end{cases}$$



Ex:

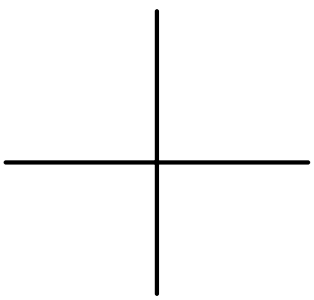
$$\begin{cases} x = 2 - t \\ y = 3 + 2t \end{cases}$$

ELIMINATE THE PARAMETER:

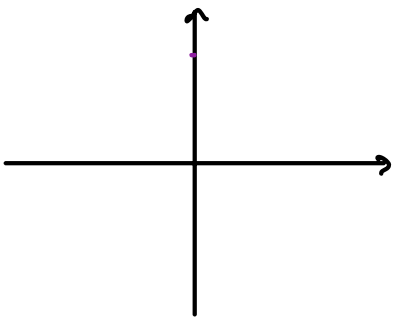


Ex:

$$\begin{cases} x = \cos t \\ y = \sin t \end{cases}$$



$$\begin{cases} x = \sin t \\ y = \cos t \end{cases}$$

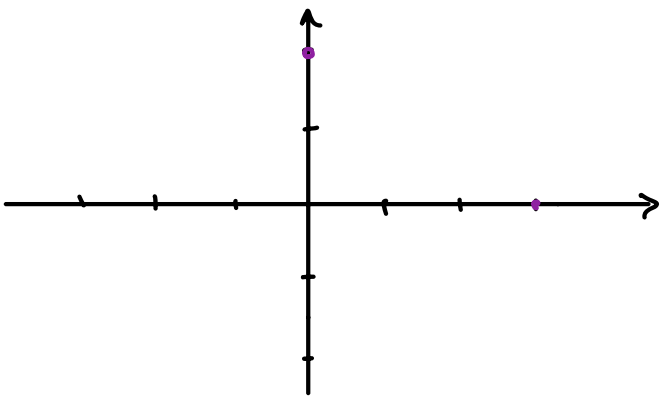


$$\cos^2 t + \sin^2 t = 1$$

$$\begin{cases} x = 3\cos t \\ y = 2\sin t \end{cases}$$

$$\begin{cases} x = 3\cos t \\ y = 2\sin t \end{cases}$$

$\frac{dy}{dx} =$



How about $\frac{d^2y}{dx^2}$?

$\frac{d^2y}{dx^2} =$

Ex: $\begin{cases} x = \sin t \\ y = 4\cos t \end{cases}$

ARC LENGTH: $$L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$$

$$\begin{cases} x = e^t \cos t \\ y = e^t \sin t \end{cases}$$