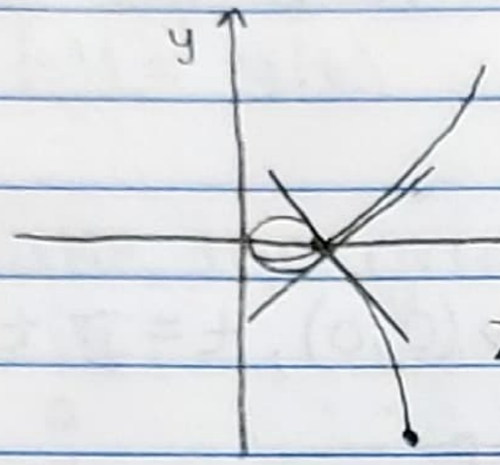
5/16/23

ex. $\begin{cases} x = t^2 \\ y = t^3 - t \end{cases}$ $t \in [-2, 2]$

t	x	y
-2	4	-6
-1	1	0
-0.5	0.25	0.375
0	0	0
0.5	0.25	-0.375
1	1	0
2	4	6



Find the two tangent lines at the point $(1,0)$

At $(1,0)$, $t = 1$ or $t = -1$

At $t = -1$:

tangent line passes through $(1,0)$ and has slope

$$\frac{dy}{dt} = t^3 - t = 3t^2 - 1 = 3(-1)^2 - 1 = 3 - 1 = 2$$

$$\frac{dx}{dt} = t^2 = 2t = 2(-1) = -2$$

$$\frac{dy}{dx}(-1) = \frac{2}{-2} = \boxed{-1}$$

equation of tangent line

$$y = 0 + (-1)(x - 1)$$

$$y = -x + 1$$

At $t = 1$:

$$\frac{dy}{dx} = \frac{3t^2 - 1}{2t} = \frac{3(1)^2 - 1}{2(1)} = \frac{2}{2} = \boxed{1}$$

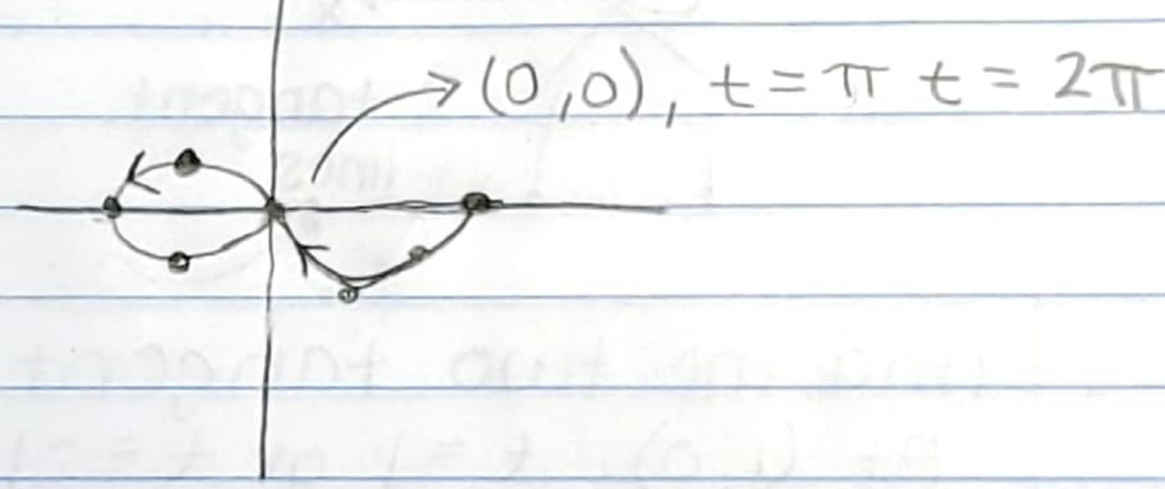
equation of tangent line $y = 0 + (1)(x - 1)$

$$y = x - 1$$

ex. Find the point where the curve interset itself $\begin{cases} x = \sin t \\ y = \sin(2t) \end{cases}$ $t \in [\frac{\pi}{2}, 2\pi]$

Then find the tangent lines at that point.

t	x	y
$\pi/2$	1	0
$2\pi/3$	.86	-.86
$3\pi/4$	.71	-1
π	0	0
$3\pi/2$	-1	0
2π	0	0
$5\pi/4$	$-\frac{\sqrt{2}}{2}$	1
$7\pi/4$	$\frac{-\sqrt{2}}{2}$	-1




```
p[s_]:=ParametricPlot[{Sin[t], Sin[2t]}, {x, Pi/2, s}]

Manipulate[p[s], {s, 1.6, 2Pi}]
```

*will show you how its drawn