

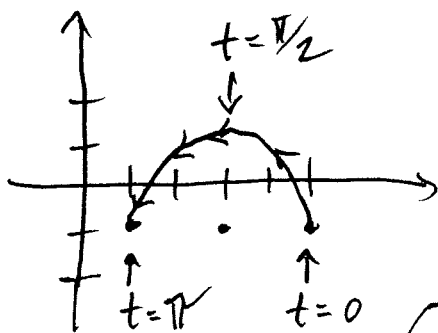
Write your name on this quiz

Consider the curve in the plane determined by the parametric equations $x(t) = 3 + 2 \cos t$ and $y(t) = -1 + 2 \sin t$, where $0 \leq t \leq \pi$.

1. Sketch this curve. (Be careful to pay attention to the interval for the t values).
2. Find the slope of the tangent line at the point on the curve corresponding to $t = \pi/2$.
3. (Bonus) How would the curve change if you replaced t in the parametric equations above with $3t$?

①
$$\begin{cases} x = a + R \cos t \\ y = b + R \sin t \end{cases} \rightarrow \text{this is a circle with radius } R \text{ and center } (a, b)$$

when $0 \leq t \leq \pi$, this is the upper semi-circle.



② At $t = \pi/2$, this is the north pole of the circle, so it has a horizontal tangent. So the slope is zero. Or compute

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{2 \cos t}{-2 \sin t}, \text{ which equals zero at } t = \pi/2.$$

③ It would move 3 times as fast, and so it would wind $1\frac{1}{2}$ times around the circle.