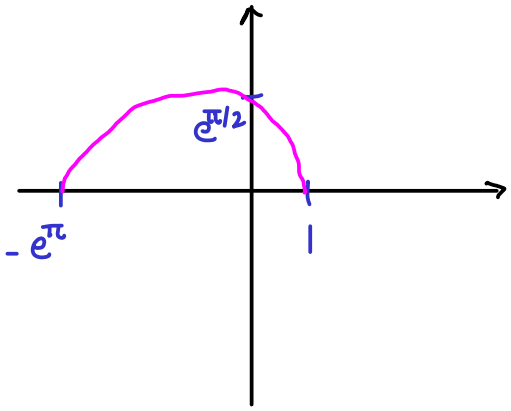
Consider the parametric equation

$$\begin{cases} x(t) = e^t \cos(t) \\ y(t) = e^t \sin(t) \end{cases}, \quad 0 \le t \le \pi.$$

Problem 1. Sketch a graph of the curve.



Problem 2. Find the slope of the tangent line to the curve at $t = \pi/2$.

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{e^t\cos(t) - e^t\sin(t)}{e^t\sin(t) + e^t\cos(t)} = \frac{\cot(t) - 1}{\cot(t) + 1}$$

$$@\ t = \frac{\pi}{2}: \quad \frac{0-1}{0+1} = \boxed{-1}$$

Problem 3. Find the exact length of the curve.

$$\int_0^{\pi} \sqrt{(e^t\sin(t) + e^t\cos(t))^2 + (e^t\cos(t) - e^t\sin(t))^2}\, dt$$

$$= \int_0^{\pi} \sqrt{2}\, e^t\, dt = \sqrt{2}\, e^t \Big|_0^{\pi} = \boxed{\sqrt{2}(e^{\pi} - 1)}$$