Please think about these questions for a few minutes, and write down a few thoughts. In a few minutes, we’ll discuss them in small groups, and then as a class.

1. Let \( x(t) = \cos t \), and \( y(t) = \sin t \). Compute the points \((x, y)\) at \( t = 0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \) and \( \frac{\pi}{2} \). Plot these points in the \( xy \) plane.

2. Again, let \( x(t) = \cos t \) and \( y(t) = \sin t \). Now plot \((x(t), y(t))\) in the \( xy \) plane for all \( 0 \leq t < 2\pi \). What shape does this form?
3. Recall that we computed the differential form for the arc length to be:

\[ ds = \sqrt{dx^2 + dy^2} \]

Multiply and divide by \(dt^2\), and simplify to get a formula relating \(ds\), \(\frac{dx}{dt}\), \(\frac{dy}{dt}\), and \(dt\).

4. Again, let \(x(t) = \cos t\) and \(y(t) = \sin t\). Compute \(ds\) in terms of \(t\) and \(dt\). Integrate this from \(t = 0\) to \(t = 2\pi\). Is this what you expect you should have gotten?