1 3.7: Derivatives of Vector Functions

Recall definition:

What the derivative of a vector function tells us:

Examples:

Find the velocity and speed if the position function is given by \( \mathbf{r}(t) = (5 \cos t)i + (5 \sin t)j \) at the point \((-3, 4)\).
Find a unit tangent vector for the curve \( r(t) = \langle t \cos t, t \sin(2t) \rangle \) at the point where \( t = \pi \).

Find parametric equations of the line tangent to the curve \( r(t) = (t^3 - t + 1)i + (t^2 + t + 1)j \) at the point where \( t = 1 \).

**On Beyond Average:** The graph of \( r(t) = (t(t^2 - 1))i + (t^2 - 1)j \) crosses itself at \((0, 0)\). Find the angle between the tangent vectors at this point.