Homework 6

April 25, 2025

1. Sketch the plane curve represented by the vector-valued function and give the orientation of the curve.

$$\mathbf{r}(t) = 2\cos\theta\,\mathbf{i} + 2\sin\theta\,\mathbf{j}$$

2. Find the limit (if it exists).

$$\lim_{t\to 0}\left(t^2\,\mathbf{i} + 3t\mathbf{j} + \frac{1-\cos t}{t}\mathbf{k}\right)$$

3. Let $f(t) = (\sin t, \cos t)$, $g(t) = (t, e^t)$, find the following derivatives:

1. $(f+g)'(0)$
2. $(f\cdot g)'(0)$
3. $(f\times g)'(0)$

4. Find the indefinite integral.

$$\int \left(e^{-t}\,\mathbf{i} + \mathbf{j} + t\sin t\,\mathbf{k}\right) dt$$