Exercises

Webwork: parameterized-curves

Chapter 17.1 # 68,71, 85

Chapter 17.2 # 29,42

Problem A: Let $\vec{r}(t) = e^t \cos(t)\vec{i} + e^t \sin(t)\vec{j}$ for t any real number. Graph $\vec{r}(t)$, the logarithmic spiral. Compute the length of $\vec{r}$ for t from $-\infty$ to 0.

Problem B: Show the product rule for $\vec{r}_1 = x_1\vec{i} + y_1\vec{j} + z_1\vec{k}$ and $\vec{r}_2 = x_2\vec{i} + y_2\vec{j} + z_2\vec{k}$:

$$\frac{d}{dt}(\vec{r}_1 \cdot \vec{r}_2) = \vec{r}_1{}' \cdot \vec{r}_2 + \vec{r}_1 \cdot \vec{r}_2{}'$$

Problem C: For a curve $\vec{r}(t)$, show that

$$\frac{d}{dt}||\vec{r}|| = \frac{\vec{r}}{||\vec{r}||} \cdot \vec{r}\,'$$

by computing $\frac{d}{dt}(\vec{r} \cdot \vec{r})$ in two different ways. Give a geometric interpretation of this statement.