Exercises

Chapter 6.3 # 1, 5, 11

Chapter 11.1 # 1, 2, 7, 9*
* For 9c, the answer in the back is wrong... extra constant and missing a **j**.

Chapter 11.2 # 1*, 6*, 12
* Sketch the graph of **F** for these problems. You may use $\alpha = \beta = \gamma = 1$ to graph #6.

Problem A: Give an example of two nonzero vectors whose cross product is zero.

Problem B: The points (1,0,0), (0,1,0), and (0,0,1) form the vertices of an equilateral triangle. Find the area of this triangle.

Problem C: Prove the *scalar triple product* identity:

$$\mathbf{u} \cdot \mathbf{v} \times \mathbf{w} = \mathbf{v} \cdot \mathbf{w} \times \mathbf{u} = \mathbf{w} \cdot \mathbf{u} \times \mathbf{v}$$

Problem D: For a curve $\mathbf{F}(t)$, show that

$$\frac{d}{dt}||\mathbf{F}|| = \frac{\mathbf{F}}{||\mathbf{F}||} \cdot \mathbf{F}'$$

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

Problem E: Let $\mathbf{F}(t) = r\cos(t)\mathbf{i} + r\sin(t)\mathbf{j} + t\mathbf{k}$ be a helix with radius r. Find the value of r which maximizes the curvature of **F**.

Problem F: Let $\mathbf{F}(t) = e^t\cos(t)\mathbf{i} + e^t\sin(t)\mathbf{j}$ for t any real number. Graph $\mathbf{F}(t)$, the logarithmic spiral. Reparameterize **F** by the arclength parameter s, and compute the length of **F** for t from $-\infty$ to 0.