Homework for 12.3 and 12.4

- 12.3, number 1abd: Let $\vec{\boldsymbol{v}} = 2\vec{\boldsymbol{i}} - 4\vec{\boldsymbol{j}} + \sqrt{5}\vec{\boldsymbol{k}}$ and $\vec{\boldsymbol{u}} = -2\vec{\boldsymbol{i}} + 4\vec{\boldsymbol{j}} - \sqrt{5}\vec{\boldsymbol{k}}$. Find $\vec{\boldsymbol{v}} \cdot \vec{\boldsymbol{u}}$, $|\vec{\boldsymbol{v}}|$, $|\vec{\boldsymbol{u}}|$, the cosine of the angle between $\vec{\boldsymbol{v}}$ and $\vec{\boldsymbol{u}}$, and the projection of $\vec{\boldsymbol{u}}$ onto $\vec{\boldsymbol{v}}$.

- 12.3, number 19: The picture (on the next page) makes it look like $\vec{\boldsymbol{v}}_1 + \vec{\boldsymbol{v}}_2$ and $\vec{\boldsymbol{v}}_1 - \vec{\boldsymbol{v}}_2$ are perpendicular. Does this happen all of the time? If not, what is special about the $\vec{\boldsymbol{v}}_1$ and $\vec{\boldsymbol{v}}_2$ in this picture that made it happen?

- 12.4, number 1: Find the length and direction of $\vec{\boldsymbol{u}} \times \vec{\boldsymbol{v}}$ and $\vec{\boldsymbol{v}} \times \vec{\boldsymbol{u}}$ for $\vec{\boldsymbol{u}} = 2\vec{\boldsymbol{i}} - 2\vec{\boldsymbol{j}} - \vec{\boldsymbol{k}}$ and $\vec{\boldsymbol{v}} = \vec{\boldsymbol{i}} - \vec{\boldsymbol{k}}$.

- 12.4, number 9: Sketch the coordinate axes and then include $\vec{\boldsymbol{u}}$, $\vec{\boldsymbol{b}}$, and $\vec{\boldsymbol{u}} \times \vec{\boldsymbol{v}}$ for $\vec{\boldsymbol{u}} = \vec{\boldsymbol{i}}$ and $\vec{\boldsymbol{v}} = \vec{\boldsymbol{j}}$

- 12.4, number 15: Let $P = (1, -1, 2)$, $Q = (2, 0, -1)$, and $R = (0, 2, 1)$. Find the area of the triangle determined by the points P, Q, and R. Also find a unit vector perpendicular to the plane containing P, Q, and R.

- 12.4, number 35: Find the area of the parallelogram with vertices $A = (1, 0)$, $B = (0, 1)$, $C = (-1, 0)$, and $D = (0, -1)$.

- 12.4, number 41: Find the area of the triangle with vertices $A = (0, 0)$, $B = (-2, 3)$, and $C = (3, 1)$.

The Picture for 12.3 #19