Name: Score:

Math 1321   Week 4 Worksheet   Due Thursday 02/06

1. What is the difference between a vector and a scalar? Give both a physical description and an algebraic answer.

2. If $\mathbf{u}$ is a vector and c is a scalar, how are $c\mathbf{u}$ and $\mathbf{u}$ related. Draw a picture to accompany your answer.

3. Prove that $\mathbf{w} \cdot (\mathbf{u} + \mathbf{v}) = \mathbf{w} \cdot \mathbf{u} + \mathbf{w} \cdot \mathbf{v}$, where $\mathbf{u}, \mathbf{v}, \mathbf{w} \in \mathbb{R}^2$.

4. Prove that if two vectors are orthogonal, then the dot product is zero.

5. Prove that $|\mathbf{u} \cdot \mathbf{v}| \le |\mathbf{u}||\mathbf{u}|$.

6. Compute the angle between the diagonal of a cube and one of its faces.

7. Under what conditions are

   (a) $\text{comp}_{\mathbf{a}}\mathbf{b} = \text{comp}_{\mathbf{b}}\mathbf{a}$

   (b) $\text{proj}_{\mathbf{a}}\mathbf{b} = \text{proj}_{\mathbf{b}}\mathbf{a}$

   (c) Provide a geometric interpretation for both of your previous answers.