CSCI 480, Fall 2015, Math Homework # 1

Name_____ Number _____

Show your work. Explain, in each case, how you got a particular numerical result. You may, of course, use a computer for numeric computations, but which expressions you used to get each result must be made clear. For example, you can't just put down 12, you must put down $2^2 + 2^2 + 2^2 = 12$. You can't just put down 4.443, you must put down $\pi \cdot \sqrt{2} = 4.443$

If you have trouble writing neat math, consider learning and using LaTeX.

1. Let $v = \langle 2, 2, 1 \rangle$ and $w = \langle 1, -2, 0 \rangle$. Find the following:

   (a) $v \cdot w$

   (b) $v \times w$

   (c) The vector projection of w on v.

2. Normalize each of the following vectors, in other words, make each vector unit length.

   (a) $v_1 = \langle \frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 0 \rangle$

   (b) $v_2 = \langle -1, 1, -1 \rangle$

   (c) $v_3 = \langle 0, -2, -2 \rangle$

3. Find the cosine of the angle between the vectors $v = \langle 1, 2, 3 \rangle$ and $w = \langle 3, 2, 1 \rangle$

4. Let $v = \langle 4, 3, -1 \rangle$. Decompose v into the sum of two vectors, one of which is parallel to $n = \langle \frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 0 \rangle$, and the other is perpendicular.

   (a) Parallel:

   (b) Perpendicular:

5. For the picture below, find:

   (a) The coordinates of q in the frame $\langle p, u, v\rangle$

   (b) The coordinates of q in the frame $\langle p, u, w\rangle$

   (c) The coordinates of q in the frame $\langle p, v, w\rangle$

   (d) The coordinates of p in the frame $\langle q, u, v\rangle$

   (e) The coordinates of p in the frame $\langle q, u, w\rangle$

   (f) The coordinates of p in the frame $\langle q, v, w\rangle$