



Name: \_\_\_\_\_

Math 130 Linear Algebra  
Quiz  
23 Oct 2009

**Problem 1.** Computations.

a. Find a unit vector in the direction of  $(4, 1, 2, 2)$ .

b. Name a nonzero vector orthogonal to the vector  $(2, 3, 1)$ .

c. Determine the area of the triangle with vertices  $(1, 2)$ ,  $(3, 4)$ , and  $(5, -6)$ . Note that the determinant of the matrix

$$\begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 1 \\ 5 & -6 & 1 \end{bmatrix}$$

is  $-24$ .

**Problem 2.** Let  $\mathbf{v}$  and  $\mathbf{w}$  be two vectors in the plane. The law of cosines implies that

$$\|\mathbf{v} - \mathbf{w}\|^2 = \|\mathbf{v}\|^2 + \|\mathbf{w}\|^2 - 2 \|\mathbf{v}\| \|\mathbf{w}\| \cos \theta$$

where  $\theta$  is the angle between the two vectors. Use that equation to prove that

$$\mathbf{v} \cdot \mathbf{w} = \|\mathbf{v}\| \|\mathbf{w}\| \cos \theta.$$

You may use the definitions and/or properties of length and dot product in your proof.