CS 130, Homework 1

Name: _____ ID: _____

Please complete the problems below. Be sure to show your work; answers alone are not enough.

Problem 1

Using the definitions below, compute the requested quantities. If the quantity does not exist, write "DNE" and give a very brief explanation.

$$\mathbf{u} = \begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix} \qquad \mathbf{v} = \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix} \qquad \mathbf{A} = \begin{pmatrix} 1 & 1 \\ -1 & 0 \\ 2 & 3 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$$

(a) $\dfrac{\mathbf{u}}{\|\mathbf{u}\|}$

(b) $\mathbf{A}^T\mathbf{A} - \mathbf{B}$

(c) $\mathbf{A}\mathbf{A}^T - \mathbf{B}$

(d) A vector of unit length that is orthogonal to both u and v

(e) A vector of the form $\alpha\mathbf{u} + \beta\mathbf{v}$ which is orthogonal to v. (α, β are scalars.)

(f) Two vectors w and x such that $\mathbf{w} + \mathbf{x} = \mathbf{u}$, w is parallel to v, and x is orthogonal to v.