Math 273
9 Sept 2016

Quiz 2
Show appropriate work.

Name: ______________

Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{2}$ Please indicate **True** or **False**. Assume the vectors **u** and **v** are non-zero.
   (a) **T** / **F** : $\mathbf{u}\cdot\mathbf{u}=0$
   (b) **T** / **F** : $\mathbf{u}\times\mathbf{u}=\mathbf{0}$
   (c) **T** / **F** : $\|\mathbf{u}_{\|\mathbf{v}}+\mathbf{u}_{\perp\mathbf{v}}\|=\|\mathbf{u}\|$
   (d) **T** / **F** : $\mathbf{k}\times\mathbf{j}=-\mathbf{i}$

2. $\boxed{4}$ Find the decomposition of $\mathbf{u}=\langle 3,-5,-7\rangle$ along $\mathbf{v}=\langle 1,2,3\rangle$, i.e. find $\mathbf{u}_{\|\mathbf{v}}$ and $\mathbf{u}_{\perp\mathbf{v}}$.

$$\vec{u}_{\|\vec{v}} = \frac{\vec{u}\cdot\vec{v}}{\vec{v}\cdot\vec{v}}\vec{v} = \frac{3-10-21}{1+4+9}\vec{v} = \frac{-28}{14}\vec{v} = -2\vec{v} = \langle -2,-4,-6\rangle$$

$$\vec{u}_{\perp\vec{v}} = \vec{u}-\vec{u}_{\|\vec{v}} = \langle 3,-5,-7\rangle - \langle -2,-4,-6\rangle = \langle 5,-1,-1\rangle$$

3. $\boxed{4}$ Find a unit vector orthogonal to both $\mathbf{u}=\langle 1,2,3\rangle$ and $\mathbf{v}=\langle 0,1,2\rangle$.

$$\vec{u}\times\vec{v} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 3 \\ 0 & 1 & 2 \end{vmatrix} = (4-3)\hat{i} - (2-0)\hat{j} + (1-0)\hat{k}$$

$$= \langle 1,-2,1\rangle$$

$$\vec{e}_{\vec{u}\times\vec{v}} = \frac{1}{\sqrt{6}}\langle 1,-2,1\rangle$$