Math 1172 - Autumn 2015 Name: _____

Quiz 9 - In Class Recitation Instructor: _____

SHOW ALL WORK!!! Unsupported answers might not receive full credit.

Problem 1 [4 pts] Suppose $\vec{u} = \hat{\imath} - \hat{\jmath} + \hat{k}$ and $\vec{v} = 2\hat{\imath} + \hat{\jmath} - 3\hat{k}$

a) [2 pts] Find $\vec{u} \times \vec{v}$.

b) [2 pts] Find a *unit* vector perpendicular to both $\vec{u}$ and $\vec{v}$

Problem 2 [2 pts] Find an equation of a line parallel to $\vec{v} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ that passes through the point $(0, 3, -1)$. Is the point $(2, 4, 0)$ on this line?

Math 1172 - Autumn 2015 Name: _____

Quiz 9 - Take Home Recitation Instructor: _____

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Problem 1 [2.5 pts] (Projecting a Vector Field Onto a Curve)
In multivariable calculus, many problems require one to find the component of a vector (field) onto a given curve at each point along the curve.

Suppose $\vec{r}(t) = \langle t^2,\, 4t,\, 4\sin t\rangle$.

a) [1 pt] Calculate the *unit* tangent vector $\hat{T}(t)$ when $t = 0$.

b) [.5 pts] Show that for any vector $\vec{F}$ and *unit* vector $\hat{v}$ that $scal_{\hat{v}}\,\vec{F} = \vec{F} \cdot \hat{v}$

c) [1 pt] Suppose $\vec{F} = \langle -1, 2, 4\rangle$. Find $scal_{\hat{T}(0)}\,\vec{F}$. This is the magnitude of the component of the vector $\vec{F}$ along the curve $\vec{r}(t)$ at $t = 0$.

Problem 2 [1.5 pts] Suppose $\vec{r}(t)$ is a differentiable vector-valued function and $|\vec{r}(t)| = 1$.

a) [.5 pts] (True or False) Is $\vec{r}\,'(t)$ a unit vector for each value of t? Think about this both conceptually and computationally!

b) [1 pt] Show that $\vec{r}(t)$ and $\vec{r}\,'(t)$ are orthogonal for each value of t.
Hint: $\vec{r}(t) \cdot \vec{r}(t) = 1$ for all t.