Math 253 Calculus III Fall 2018 **Quiz # 1, 5 Sept 2018**

Name: _____

There are 20 points possible on this quiz. This is a closed book quiz and closed note quiz. Calculators are not allowed. If you have any questions, please raise your hand.

1. (2 points each) Use vectors $\vec{a} = 4\vec{i} - 3\vec{j} + \vec{k}$ and $\vec{b} = -\vec{i} + 6\vec{k}$ answer the questions below.

   (a) Find $|\vec{a}|$

   (b) Find $\vec{a} - 3\vec{b}$

   (c) Find $\vec{a} \cdot \vec{b}$

   (d) Find a **unit** vector, $\vec{u}$, in the direction *opposite* vector $\vec{a}$.

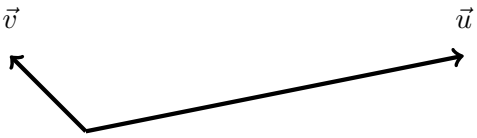
   (e) Find a vector, $\vec{w}$, of length 5 in the direction of vector $\vec{b}$.

   (f) Determine if vector $\vec{c} = \langle 2, 4, -4 \rangle$ is orthogonal to vector $\vec{a}$. You must show your work to receive credit.

   (g) Find the scalar projection of $\vec{b}$ onto $\vec{a}$.

   (h) Find the vector projection of $\vec{b}$ onto $\vec{a}$.

2. (2 points each) Let vectors $\vec{u}$ and $\vec{v}$ be graphed below.



(a) In the drawing above, sketch the vector projection of $\vec{v}$ onto $\vec{u}$. Clearly indicate your answer.

(b) Would the scalar projection of $\vec{v}$ onto $\vec{u}$ be positive, negative or zero? Explain your answer.