Name: _____

Quiz 9

This quiz is graded out of 13 marks. No books, watches, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* Let $\vec{u}$ and $\vec{v}$ be nonzero vectors in $\mathbb{R}^2$ or $\mathbb{R}^3$, and let $k = ||\vec{u}||$ and $l = ||\vec{v}||$. Prove that the vector $\vec{w} = l\vec{u} + k\vec{v}$ bisects the angle between $\vec{u}$ and $\vec{v}$.

Question 2.[1] Given the following points: $A = (3,1,1,1)$, $B = (2,1,3,0)$, and $C = (1,0,3,1)$.

a. *(4 marks)* Find the point on the line containing A and C that is closest to B.

b. *(2 marks)* Find the area of the triangle with vertices at points A, B, and C.

Question 3. *(2 marks)* Determine whether the following statement is true or false. If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.
If the relationship $\text{proj}_{\vec{a}}\vec{u} = \text{proj}_{\vec{a}}\vec{v}$ holds some nonzero vector $\vec{a}$, then $\vec{u} = \vec{v}$.

[1] modified from a John Abbott Final Examination