By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else during the exam:

Name (sign): _____ Name (print): _____

1. [4 pts] Given the vectors $\mathbf{a} = \mathbf{i} + \mathbf{j} + \mathbf{k}$ and $\mathbf{b} = \mathbf{i} - \mathbf{j} + \mathbf{k}$. Determine the vector projection $\mathsf{proj}_{\mathbf{a}}(\mathbf{b})$ of $\mathbf{b}$ onto $\mathbf{a}$.

2. True/False. If the statement is true, give an explanation why you think so. If a statement is false, provide a counter-example.

   (a) [3 pts] The cross product of two unit vectors is a unit vector.

   (b) [3 pts] If $\mathbf{u}$ is a scalar multiple of $\mathbf{v}$, then $\mathbf{u} \times \mathbf{v} = \mathbf{0}$.

   (c) [3 pts] If $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ are all non-zero vectors in space and $\mathbf{u} \cdot \mathbf{v} = \mathbf{u} \cdot \mathbf{w}$, then $\mathbf{v} = \mathbf{w}$.

   (d) [3 pts] The vector equation
   $$\langle x, y, z \rangle \times \langle 1, 1, 1 \rangle = \langle 0, 1, 0 \rangle$$
   has a solution in $\mathbb{R}^3$.