Books, notes (in any form), and calculators are not allowed. *Show all your work.* Good Luck!

1. (1 pts) Which of the following formulas is correct?

$$\text{proj}_\mathbf{u}\mathbf{v} = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{v}|^2}\mathbf{v} \qquad \text{proj}_\mathbf{u}\mathbf{v} = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{u}|^2}\mathbf{v} \qquad \text{proj}_\mathbf{u}\mathbf{v} = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{v}|^2}\mathbf{u} \qquad \text{proj}_\mathbf{u}\mathbf{v} = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{u}|^2}\mathbf{u}$$

2. (4 pts) Given $\mathbf{a} = \langle -2, 2, 1 \rangle$ and $\mathbf{b} = \langle 3, -1, 2 \rangle$, find the vector projection of $\mathbf{a}$ onto $\mathbf{b}$ and simplify.

3. (5 pts) A tow truck drags a stalled car along a road. The chain makes an angle of $30°$ with the road and the tension in the chain is 1500 N. How much work is done by the truck pulling the car 1 km? [Include units.]

4. (5 pts) Given $\mathbf{a} = 2\mathbf{i} - 3\mathbf{k}$ and $\mathbf{b} = \mathbf{j} + 2\mathbf{k}$, find $\mathbf{a} \times \mathbf{b}$.

5. (5 pts) Use the scalar triple product to determine if the following vectors are coplanar. Show work and clearly state your conclusion.

$\mathbf{a} = \langle -1, 0, 2 \rangle$, $\mathbf{b} = \langle 2, 3, 5 \rangle$, and $\mathbf{c} = \langle -3, 1, 9 \rangle$