Name: **ID:** .

1. Find the sum of the vectors $\mathbf{u} = \langle 2, -1 \rangle$ and $\mathbf{v} = \langle -1, 3 \rangle$ and illustrate this operation geometrically.

2. A model rocket experiences a force due to gravity $\mathbf{W} = \langle 0, -1 \rangle$ pounds and a force from its engine $\mathbf{F} = \langle 1, 5 \rangle$ pounds. Find the total force vector $\mathbf{T}$ acting on the rocket and the total scalar amount of force as well. Units please.

3. Find the angle between the vectors $\mathbf{a} = \langle 1, 2, 1 \rangle$ and $\mathbf{b} = \langle 2, 2, 3 \rangle$. You are welcome to leave your answer in terms of an inverse trig function.

4. For the same vectors $\mathbf{a} = \langle 1, 2, 1 \rangle$ and $\mathbf{b} = \langle 2, 2, 3 \rangle$ as in the previous problem, compute the orthogonal projection of $\mathbf{a}$ onto $\mathbf{b}$. Using your book's notation, this projection is $\text{proj}_{\mathbf{b}}\mathbf{a}$. You do not need to simplify your work, but your answer must be in a form where a person with a calculator could easy compute the numerical values of the components of the vector. Note that you may have already done some of the computations needed to solve this problem...