(1) [4 points] Without computing it, explain how you could find the distance between the two lines $y = 2x + 3$ and $y = 2x - 3$ in the $xy$-plane. (Hint: One approach is to realize the distance as the scalar projection of one vector onto another. Try to use that the direction of a line is determined by a normal direction in the plane.)

(2) [3 points each] What is wrong with the following statements? Explain why they are false and modify them to be correct in all cases.
   (a) If $\vec{v} \cdot \vec{w} = \vec{v} \cdot \vec{u}$ and $\vec{v} \neq \vec{0}$ then $\vec{w} = \vec{u}$
   (b) A line and a plane in 3 dimensions intersect in one point.

(3) [6 points] Answer at least one of the following questions (both for 2 points of extra credit).
   (a) We start with two three-dimensional vectors $\vec{v}$ and $\vec{w}$. Suppose that we know $\vec{v} \times \vec{u} = \vec{w} \times \vec{u}$ for every three-dimensional vector $\vec{u}$. Prove that $\vec{v} = \vec{w}$. (Hint: Choose a few simple vectors for $\vec{u}$ and compute the cross products. What does this say about the coordinates of $\vec{v}$ and $\vec{w}$?)
   (b) If $\vec{u} + \vec{v} + \vec{w} = \vec{0}$, then $\vec{u} \times \vec{v} = \vec{v} \times \vec{w} = \vec{w} \times \vec{u}$. 