

Rules: Work the following exercises with your group. You can use your textbook and your notes. You will turn in just one assignment, so make sure you write down the names of all participants of your group.

1. Explain why the following expressions do not make sense:

(a) $\mathbf{a} \times \mathbf{a} = \|\mathbf{a}\|$.

(b) $\mathbf{a} \cdot (\mathbf{c} \times \mathbf{b}) = \mathbf{a} \cdot (\mathbf{c}) \times \mathbf{b}$.

2. Let \mathbf{c} be a vector which is perpendicular to the plane given by the two vectors \mathbf{a} and \mathbf{b} . Explain why $\mathbf{c} \times (\mathbf{a} \times \mathbf{b})$ is equal to the zero vector.

3. Two proofs:

(a) Show that given three vectors $\mathbf{v}, \mathbf{w}, \mathbf{z} \in R^3$ one has $\mathbf{v} \cdot (\mathbf{w} + \mathbf{z}) = \mathbf{v} \cdot \mathbf{w} + \mathbf{v} \cdot \mathbf{z}$.

(b) Show part 5 of Theorem 4.3 of your book.

4. (a) Let $P(1, 0, 0), Q(0, 2, 3)$ and $R(0, 1, 1)$ be three points in R^3 , find the equation of the plane π given by the three points.

(b) Find the parametric equation of the line \mathcal{L} given by the intersection of the plane π and the xy -plane.

(c) Let S be a point in the line \mathcal{L} such that the x -coordinate is equal to 10. Find the area of the triangle given by P, S and the origin.

(d) Find the volume of the pyramid with base the triangle PSO and vertex R .