

1. Prove that geometrical definitions of scalar and vector products are equivalent to their definitions in components. Clue: express the vectors in the form

$$A = A_1 \mathbf{e}_1 + A_2 \mathbf{e}_2 + A_3 \mathbf{e}_3$$

etc. and use properties of the vectors \mathbf{e}_α .

2. A cylinder of radius R is rolling on a horizontal plane. Find the trajectory of a point in the cylinder situated at the distance a from its center and plot it with Mathematica.

3. Plot the vector field created by two charges, same and different signs. Make corresponding Manipulation or Animation.