Given 3 vectors: \( \vec{W}, \vec{F}, \vec{N} \) whose magnitudes are: 10, 3, 5

Obtain the following:

1. \( \vec{W}, \vec{F}, \vec{N} \) in component notation in coordinate system \( S \)

2. \( \vec{W}, \vec{F}, \vec{N} \) in component notation in coordinate system \( S' \)

3. \( \vec{R} \) such as \( \vec{R} = \vec{W} + \vec{F} + \vec{N} \)
   in coordinate system \( S \) (Resultant Vector)

4. \( \vec{R} \) such as \( \vec{R} = \vec{W} + \vec{F} + \vec{N} \)
   in coordinate system \( S' \) (Resultant Vector)

5. \( \vec{E} \) such as \( \vec{W} + \vec{F} + \vec{N} + \vec{E} = \vec{0} \)
   in coordinate system \( S \) (Equilibrium Vectors)
6. \( \mathbb{E}^6 \) such as \( \vec{W} + \vec{j} + \vec{N} + \vec{e} = 0 \) in coordinate system \( S' \) (EQUILIBRANT VECTORS)

7. Explain in words the relationship between \( \vec{R} \) and \( \vec{E}^6 \)

8. Express MATHEMATICALLY the relationship between \( \vec{R} \) and \( \vec{E}^6 \)

9. Compute: \( \vec{W} \cdot \vec{j}, \vec{j} \cdot \vec{N} \)

   Deduce the relationship between \( \vec{j} \) and \( \vec{N} \) based on the results of the dot product.

10. Compute:
    \[
    \begin{cases}
    \vec{P} = \vec{W} \times \vec{N} & \text{using a } 3 \times 3 \\
    \vec{R} = \vec{N} \times \vec{W} & \text{matrix}
    \end{cases}
    
    What is the relationship between \( \vec{P} \) and \( \vec{R} \)?

11. Find the parallel component of \( \vec{f} \) along a line \( L \) whose direction is 60° with respect to the \( y' \) going clockwise using \( \vec{f}^p = \vec{f} \cdot \hat{e} \) \( \hat{e} \) with \( \hat{e} \) being a unit vector along \( L \).

12. Deduce \( \vec{f}_1 \): the perpendicular component of \( \vec{f} \) with respect to \( LC \) using \( \vec{f} = \vec{f}_1 + \vec{f}_\perp \).