汇交力系的合力投影定理

航海力学

汇交力系的合力投影定理

设汇交力系F_1， $F_2 \cdots F_n$中任一力F_i在直角坐标系oxy三个坐标轴上的投影为X_i、 Y_i 、Z_i，沿坐标轴正向的单位矢量为 i, j, k ,则力的解析式为：

$$F_i = X_i i + Y_i j + Z_i k$$

$$\Downarrow$$

$$F_1 = X_1 i + Y_1 j + Z_1 k$$

$$F_2 = X_2 i + Y_2 j + Z_2 k$$

$$\vdots \qquad \vdots$$

$$F_n = X_n i + Y_n j + Z_n k$$

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$$F_1 = X_1 i + Y_1 j + Z_1 k$$

$$F_2 = X_2 i + Y_2 j + Z_2 k$$

$$\vdots \qquad \vdots$$

$$F_n = X_n i + Y_n j + Z_n k$$

$$\Downarrow$$

$$R = \sum_{i=1}^{n} F_i = (\sum_{i=1}^{n} X_i) i + (\sum_{i=1}^{n} Y_i) j + (\sum_{i=1}^{n} Z_i) k$$

$$R = R_x i + R_y j + R_z k$$

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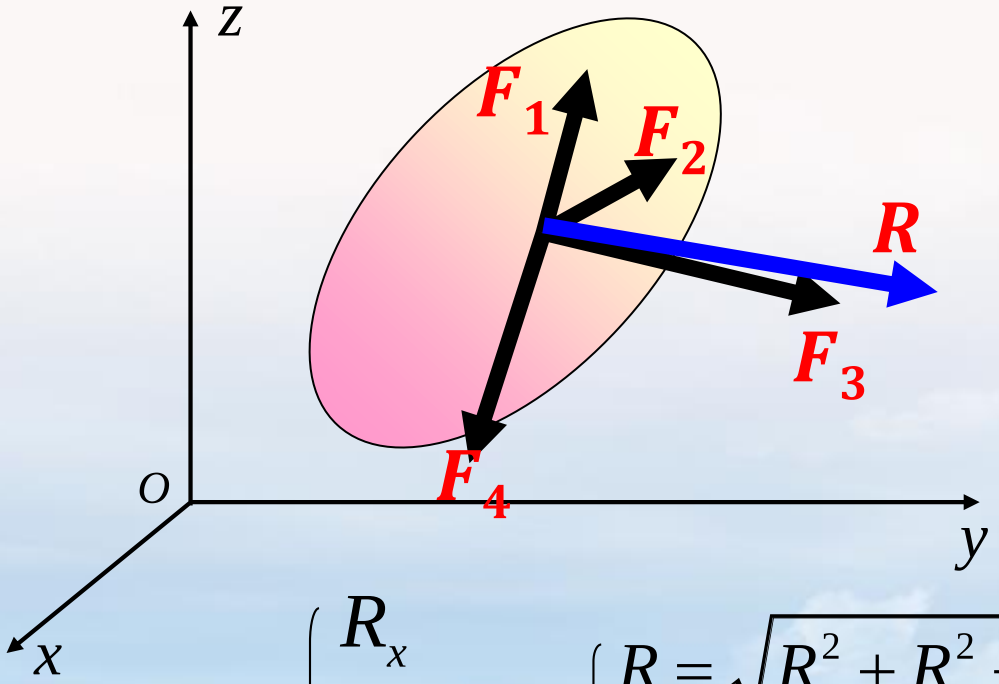
$$\begin{cases} R = \sum_{i=1}^{n} F_i = (\sum_{i=1}^{n} X_i) i + (\sum_{i=1}^{n} Y_i) j + (\sum_{i=1}^{n} Z_i) k \\ R = R_x i + R_y j + R_z k \end{cases}$$

$$\begin{cases} R_x = \sum X \\ R_y = \sum Y \\ R_z = \sum Z \end{cases}$$

汇交力系合力投影定理：合力在任一轴上的投影等于各分力在同一轴上投影的**代数和**。

汇交力系的合力投影定理

应用汇交力系合力投影定理求汇交力系的合力



$$
\begin{cases}
R_x = \sum X \\
R_y = \sum Y \\
R_z = \sum Z
\end{cases}
$$

$$
R \Rightarrow \begin{cases} R_x \\ R_y \\ R_z \end{cases} \Rightarrow \begin{cases} R = \sqrt{R_x^2 + R_y^2 + R_z^2} \\ \cos(R, i) = \dfrac{R_x}{R}, \cos(R, j) = \dfrac{R_y}{R}, \cos(R, k) = \dfrac{R_z}{R} \end{cases}
$$

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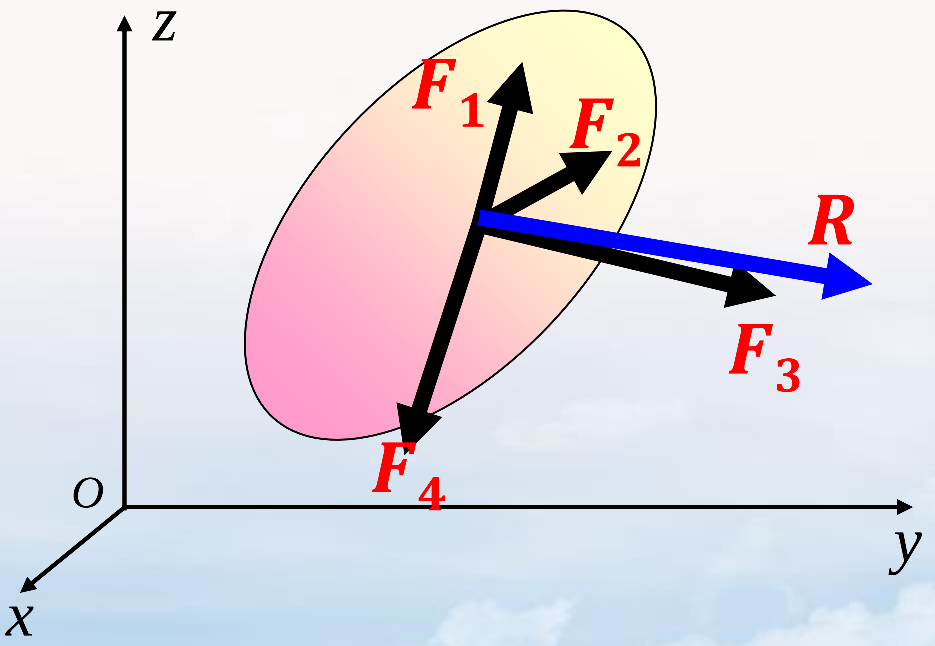

$$\sum X = R_x$$
$$\sum Y = R_y$$
$$\sum Z = R_z$$

$$\Rightarrow \begin{cases} R = \sqrt{R_x^2 + R_y^2 + R_z^2} \\ \cos(R, i) = \dfrac{R_x}{R}, \cos(R, j) = \dfrac{R_y}{R}, \cos(R, k) = \dfrac{R_z}{R} \end{cases}$$