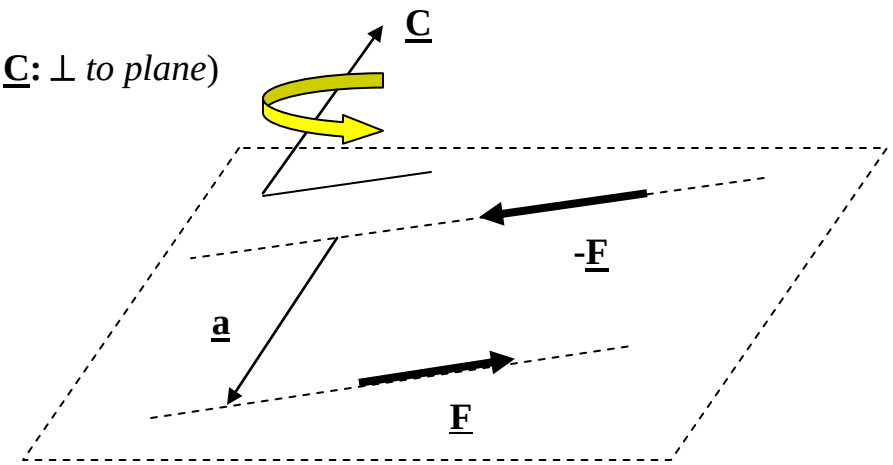
Homework Assignment: # 2

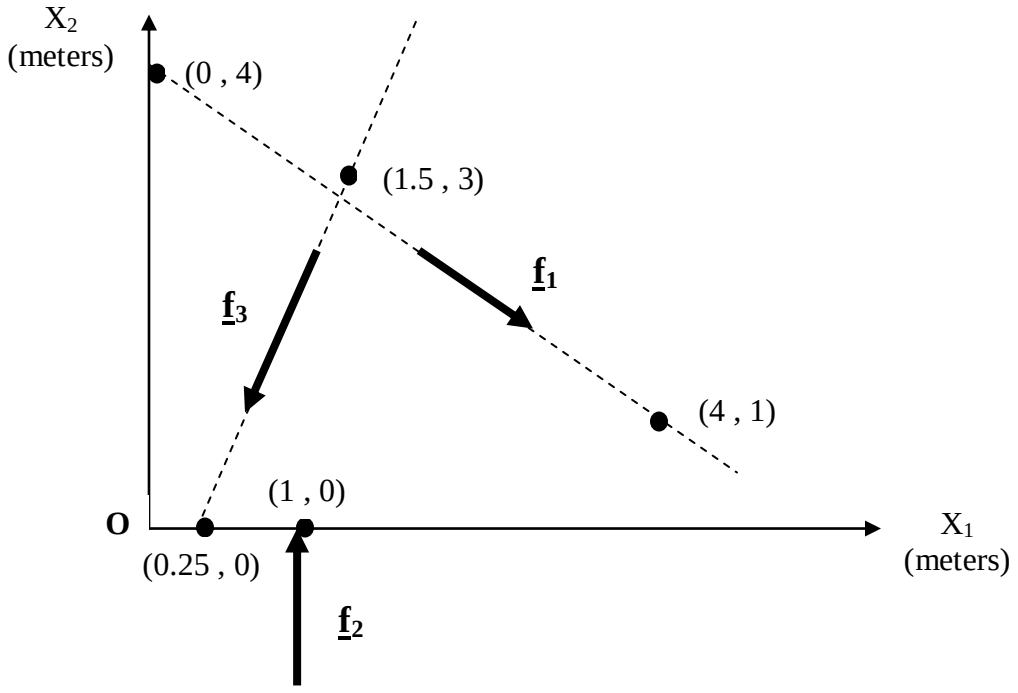
1. Show that the moment arm **r** of a force **f** about a moment center "**O**" can be directed from "**O**" to any point on the line of action of **f**.

2. Show that the couple arm **a** can be any vector connecting from one point on the line of action of **–F** to one on that of **F**.

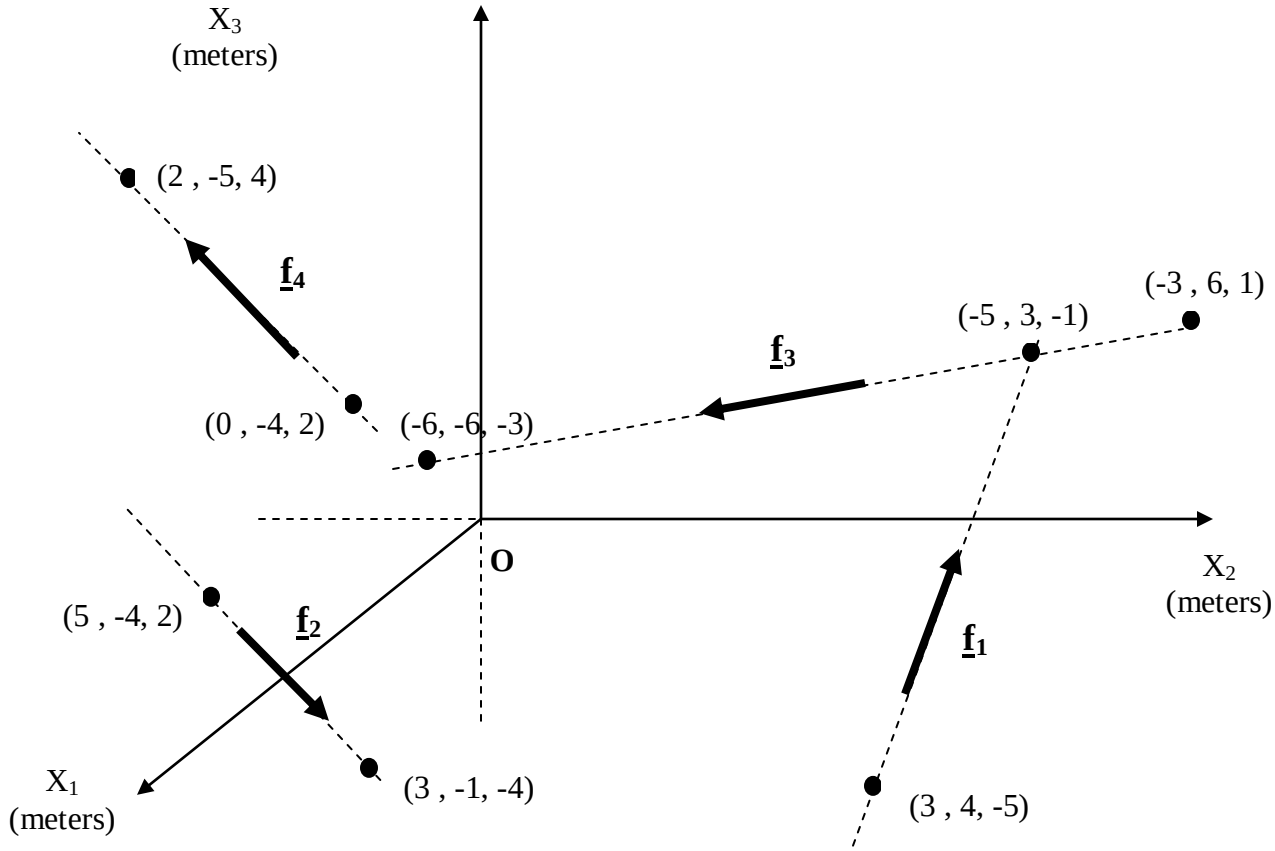
(**a**, **F**, **-F:** *coplanar*, **C:** ⊥ *to plane*)



3. Given the following force systems, solve for the resultant system at the origin "O".



(a): $\{f_1=25\ N,\ f_2=63\ N,\ f_3=52\ N\}$



(b): {f_1=36 N, f_2=49 N, f_3=52 N, f_4=21 N}

4. The vector $\underline{A} = 24\sinh(4t)\underline{e}_1 + 10\sinh(4t)\underline{e}_2 + 26\underline{e}_3$ changes in magnitude and also spins at an angular velocity of $\underline{\omega}_A = \underline{e}_1 + 8\underline{e}_2 + 4\underline{e}_3 \quad rad/s$. Determine the time rate of change of the vector A?

5. Check the *Dimensional Homogeneity Theorem* for the following relation: $\underline{M}^o = \underline{\underline{I}}^o \cdot \underline{\alpha} + \underline{\omega} \times (\underline{\underline{I}} \cdot \underline{\omega})$, where: $\underline{\underline{I}}$: inertia tensor; $\underline{M}$: moment of force; $\underline{\omega}$: angular velocity; $\underline{\alpha}$: angular acceleration.