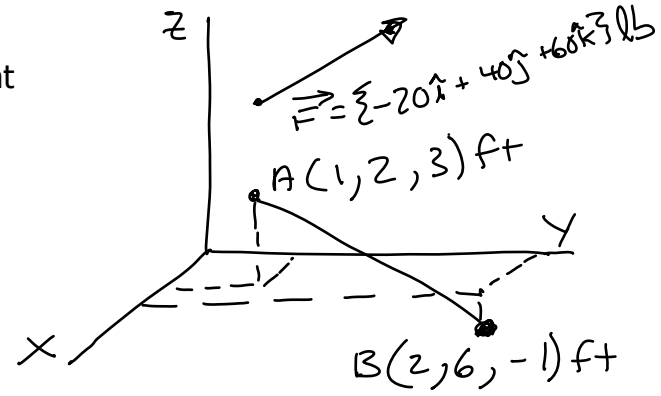
# Resolving forces into components along a line of action

**Problem Statement:** Determine the component of the force along line AB. Express your answer as a cartesian vector.




1.) Resolve the force into a cartesian vector.

Already in cartesian form

$$\vec{F} = \{-20\hat{i} + 40\hat{j} + 60\hat{k}\}\ lb$$

2.) Determine the unit vector for the component line of action.

$$\vec{r}_{AB} = \{1\hat{i} + 4\hat{j} - 4\hat{k}\}\ ft \qquad r_{AB} = 5.74\ ft$$

$$\vec{u}_{AB} = \frac{\vec{r}_{AB}}{r_{AB}} = \{0.1742\hat{i} + 0.6969\hat{j} - 0.6969\hat{k}\}$$

3.) Take the dot product of the force rector and the unit vector to get the magnitude of the component.

$$F_{AB} = \vec{F} \cdot \vec{u}_{AB}$$
$$= (-20)(0.1742) + (40)(0.6969) + (60)(-0.6969)$$
$$= -17.42\ lb$$

4.) Multiply the magnitude of the component by the unit vector to get the component in cartesian vector form.

$$\vec{F}_{AB} = (-17.42\ lb)(0.1742\hat{i} + 0.6969\hat{j} - 0.6969\hat{k}\}$$

$$\vec{F}_{AB} = \{-3.03\hat{i} - 12.14\hat{j} + 12.14\hat{k}\}\ lb$$