**Quiz #3**

The weights of collars $A$ and $B$ are $W_A = 30$ lb and $W_B = 45$ lb. If friction is negligible and equilibrium exists, determine $(a)$ the reaction $A$ exerted on the collar $A$ by the rod, $(b)$ the reaction $B$ exerted on the collar $B$ by the rod.

Collar $A$: \[ T_{AB} + A + W_A = 0 \]

\[
T_{AB} = \frac{T_{AB}}{13}(4i + 3j - 12k) \quad A = A_x i + A_z k \quad W_A = -30j
\]

\[
i: \quad \frac{4}{13} T_{AB} + A_x = 0 \quad j: \quad \frac{3}{13} T_{AB} - 30 = 0 \quad k: \quad -\frac{12}{13} T_{AB} + A_z = 0
\]

We get $T_{AB} = 130, \ A_x = -40, \ A_z = 120$.

\[ \therefore \ A = -40i + 120k \text{ lb} \]

Collar $B$: \[ T_{BA} + B + W_B + P = 0 \]

\[
T_{BA} = -T_{AB} = \frac{T_{AB}}{13}(-4i - 3j + 12k) = -40i - 30j + 120k
\]

\[
B = \frac{B_{xy}}{5}(3i + 4j) + B_z k \quad W_B = -45j \quad P = \frac{P}{5}(-4i + 3j)
\]

\[
i: \quad -40 + \frac{3}{5} B_{xy} - \frac{4}{5} P = 0 \quad j: \quad -30 + \frac{4}{5} B_{xy} - 45 + \frac{3}{5} P = 0 \quad k: \quad 120 + B_z = 0
\]

We get $B_{xy} = 84, \ B_z = 120, \ P = 13$.

\[ \therefore \ B = 50.4i + 67.2j - 120k \text{ lb} \]