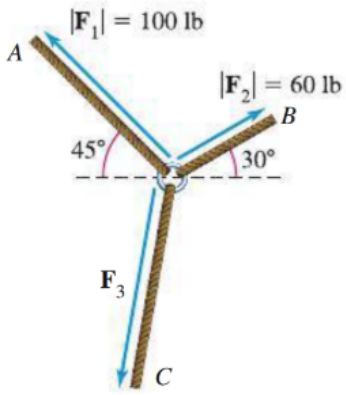
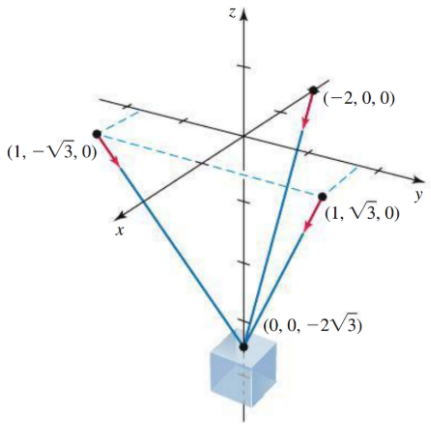
1. Three people located at A, B, and C pull on ropes tied to a ring. Find the magnitude and direction of the force with which the person at C must pull so that no one moves.



2. A 500-lb load hangs from three cables of equal length that are anchored at points $(-2, 0, 0)$, $(1, \sqrt{3}, 0)$, and $(1, -\sqrt{3}, 0)$. The load is located at $(0, 0, -2\sqrt{3})$. Find the vectors describing the forces on the cables due to the load.



3. A 100-kg object rests on an inclined plane at an angle of 45° to the floor. Find the components of the force parallel to an perpendicular to the plane.

4. Find the midpoint of the line segment joining $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$.

5. **Cauchy-Schwarz** Because $\mathbf{u} \cdot \mathbf{v}| = |\mathbf{u}||\mathbf{v}| \cos\theta$ and $|\cos\theta| \leq 1$, it follows that $|\mathbf{u} \cdot \mathbf{v} \leq |\mathbf{u}||\mathbf{v}|$. Let $\mathbf{u} = \langle\sqrt{a}, \sqrt{b}\rangle, \mathbf{u} = \langle\sqrt{b}, \sqrt{a}\rangle$, show that $\sqrt{ab} \leq \dfrac{a+b}{2}$ where $a, b \geq 0$.

6. Find all unit vectors $\vec{u} \in \mathbb{R}^3$ that make a 60° angle with the unit vector $\vec{k}$. Find the projection $\mathbf{proj_k}\vec{u}$.

7. Find a vector orthogonal to both $\langle 1, 2, 3\rangle$ and $\langle -2, 4, -1\rangle$.

8. Find the value a such that

$$\langle a, a, 2\rangle \times \langle 1, a, 3\rangle = \langle 2, -4, 2\rangle.$$

9. Find the area of the parallelepiped determined by vectors $\vec{u}, \vec{v}$, and $\vec{w}$.

