Chapter 2 Forces (Acting upon one body on another)

Representation of a force \( \vec{F} \)

- **Magnitude**
- **Direction**

\[ \text{O}: \text{define the orientation of } \vec{F} \]

\[ \text{Head}: \text{define the sense of } \vec{F} \]

**Orientation + Sense = Direction**

Triangle Rule: If two vectors are drawn to scale and arranged in tip-to-tail fashion, then the sum of these two vectors is given by the vector drawn from the tail of the first vector to the tip of the second vector.

\[ \vec{A} + \vec{B} = \vec{C} \]

Polygon Rule:

\[ \vec{E} = \vec{A} + \vec{B} + \vec{C} + \vec{D} \]

**Directional angle** \( \theta \) of \( \vec{F} \):

\[ \cos \theta = \frac{\vec{F} \cdot \hat{x}}{F} \]

\[ \vec{F} = F_x \hat{x} + F_y \hat{y} \]

**Vector Algebra**

Parallelogram Law:

\[ \vec{A} + \vec{B} = \vec{C} \]

\[ \vec{A} + \vec{B} = \vec{B} + \vec{A} = \vec{C} \]

2.8

\[ F = 400 \, \text{N}, \ A = 300 \, \text{N}, \ B = 600 \, \text{N} \]

\[ 0 < \theta_A < 150^\circ \]

\[ \theta_B = ? \]

\[ \vec{A} + \vec{B} = \vec{E} \]

**Law of cosines**:

\[ F = A_B^2 - 2AB \cos \alpha \]

\[ \phi + \beta = 30^\circ \]

\[ \theta_A + \phi = \alpha \]

\[ \theta_B + \phi = 180^\circ \]