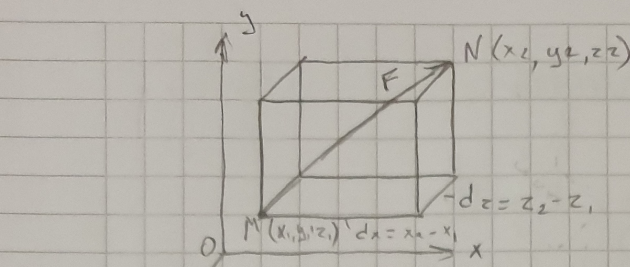

d - scalar

$$\overline{MN} = d_x \bar{i} + d_y \bar{j} + d_z \bar{k}$$

$$\bar{\lambda} = \frac{\overline{MN}}{MN} = \frac{\overline{MN}}{d} = \frac{1}{d}\overline{MN} =$$

$$= \frac{1}{d}(d_x \bar{i} + d_y \bar{j} + d_z \bar{k})$$

$$\bar{F} = F \cdot \bar{\lambda} = \frac{F}{d}(d_x \bar{i} + d_y \bar{j} + d_z \bar{k})$$

$$F_x = \frac{F d_x}{d}; \quad F_y = \frac{F d_y}{d}; \quad F_z = \frac{F d_z}{d}$$

$$d = \sqrt{d_x^2 + d_y^2 + d_z^2}$$

$d_x = x_2 - x_1$ $\quad d_z = z_2 - z_1$

$d_y = y_2 - y_1$

Also "d" can be replaced w "F" (F_x, F_y, F_z)

$$\cos\theta_x = \frac{d_x}{d} \quad \cos\theta_y = \frac{d_y}{d}$$

$$\cos\theta_z = \frac{d_z}{d}$$

Concurrent Forces (addition)

$$\bar{R} = \Sigma \bar{F} \Rightarrow R_x \bar{i} + R_y \bar{j} + R_z \bar{k} = \Sigma (F_x \bar{i} + F_y \bar{j} + F_z \bar{k})$$

$$= \Sigma (F_x \bar{i}) + \Sigma (F_y \bar{j}) + \Sigma (F_z \bar{k})$$

$$R = \sqrt{R_x^2 + R_y^2 + R_z^2}$$

$$\cos\theta_x = \frac{R_x}{R} \quad \cos\theta_y = \frac{R_y}{R} \quad \cos\theta_z = \frac{R_z}{R}$$

$R_x = \Sigma F_x \bar{i}$ $\quad R_y = \Sigma F_y \bar{j}$

$R_z = \Sigma F_z \bar{k}$

Equilibrium of particle in Space

$$R_x = \Sigma F_x = 0; \quad R_y = \Sigma F_y = 0; \quad R_z = \Sigma F_z = 0$$

Problem:

AB - 2100N

AC - ?N

AD - ?N

Solution:

$$AB = \sqrt{(4)^2 + (20)^2 + (-5)^2} = 21\,m$$

$$\bar{F} = F\lambda_{AB} = F\frac{\overline{BA}}{BA} \Rightarrow \frac{F}{BA} = \overline{BA} = \frac{2100}{21}[(4)i + (20)j + (-5)k]$$

$$\therefore F = (400)i + (2000)j + (-500)k$$

$F_x = 400N$, $F_y = 2000N$ $\quad F_z = -500N$

Rigid bodies

Equivalent force systems:

- Moment about a force.

External forces

$\sigma^F = \ldots$