Forces in Three-Dimensional Space

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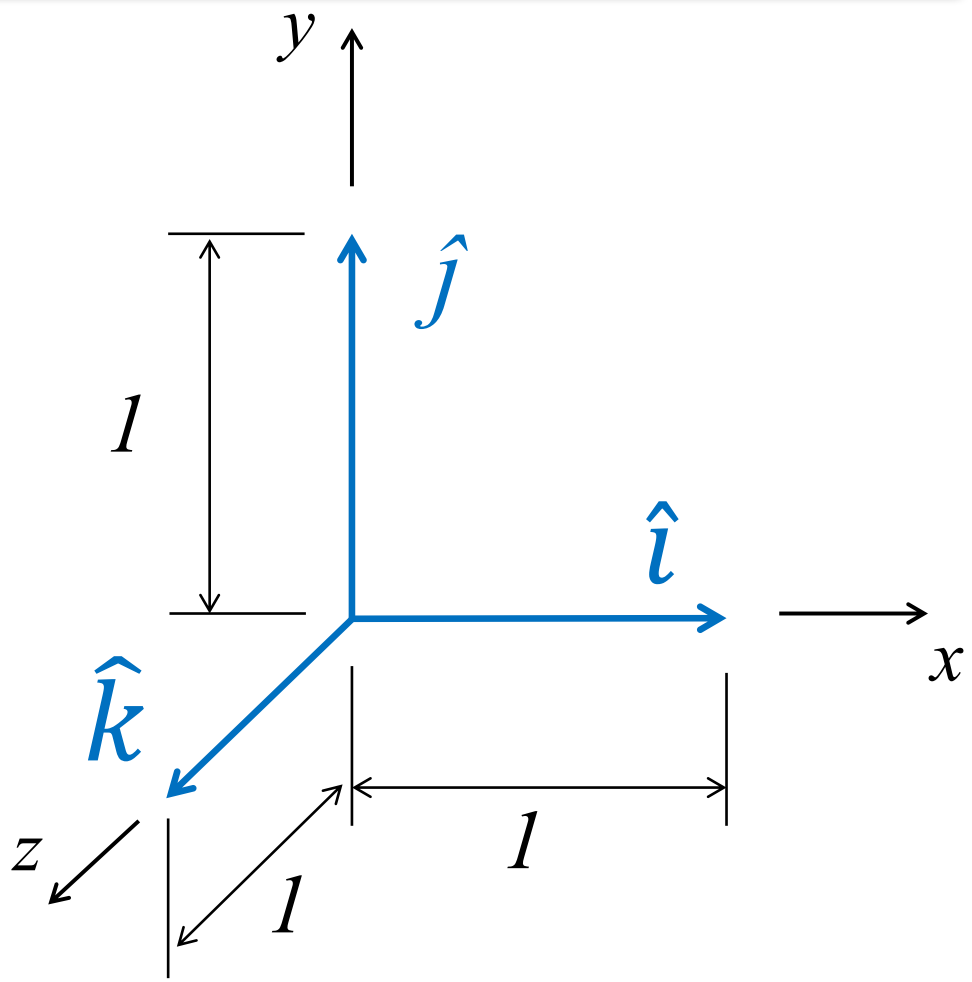
Rectangular Components of a Force in Three-Dimensional Space

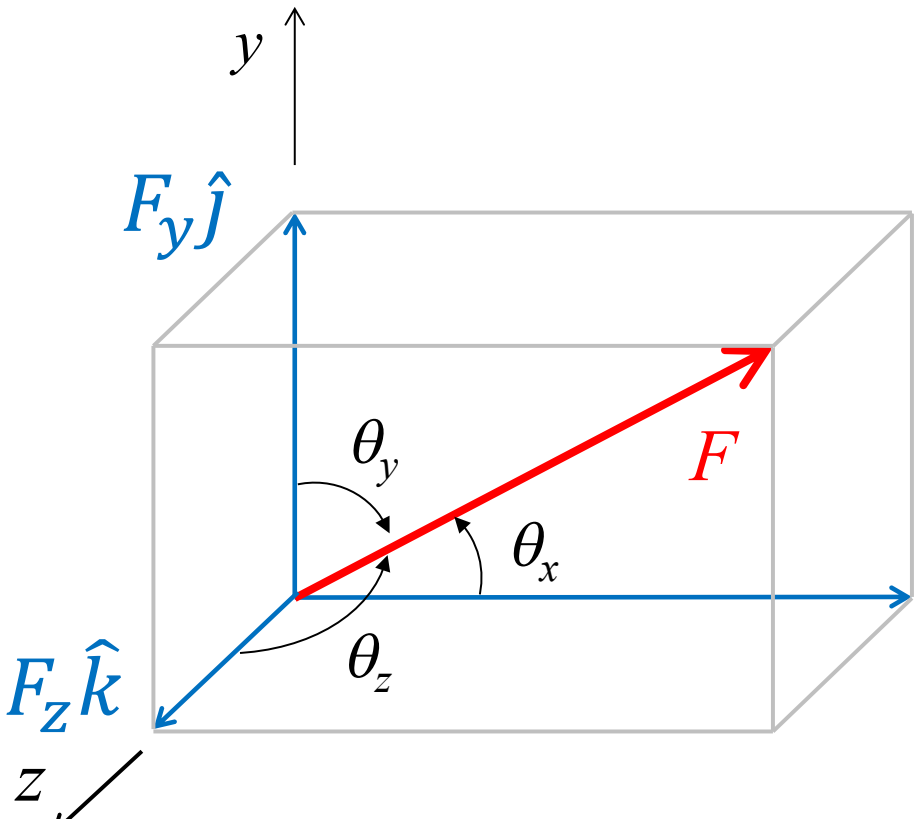
Define unit vectors in the *x*, *y* and *z* directions



Rectangular Components of a Force in Three-Dimensional Space

Cartesian Vector Form of $\boldsymbol{F}$

$$\boldsymbol{F} = F_x\hat{\imath} + F_y\hat{\jmath} + F_z\hat{k}$$



Scalar components of $\boldsymbol{F}$

$$F_x = F\cos\theta_x$$

$$F_y = F\cos\theta_y$$

$$F_z = F\cos\theta_z$$

Magnitude of $\boldsymbol{F}$

$$F = \sqrt{F_x^2 + F_y^2 + F_z^2}$$

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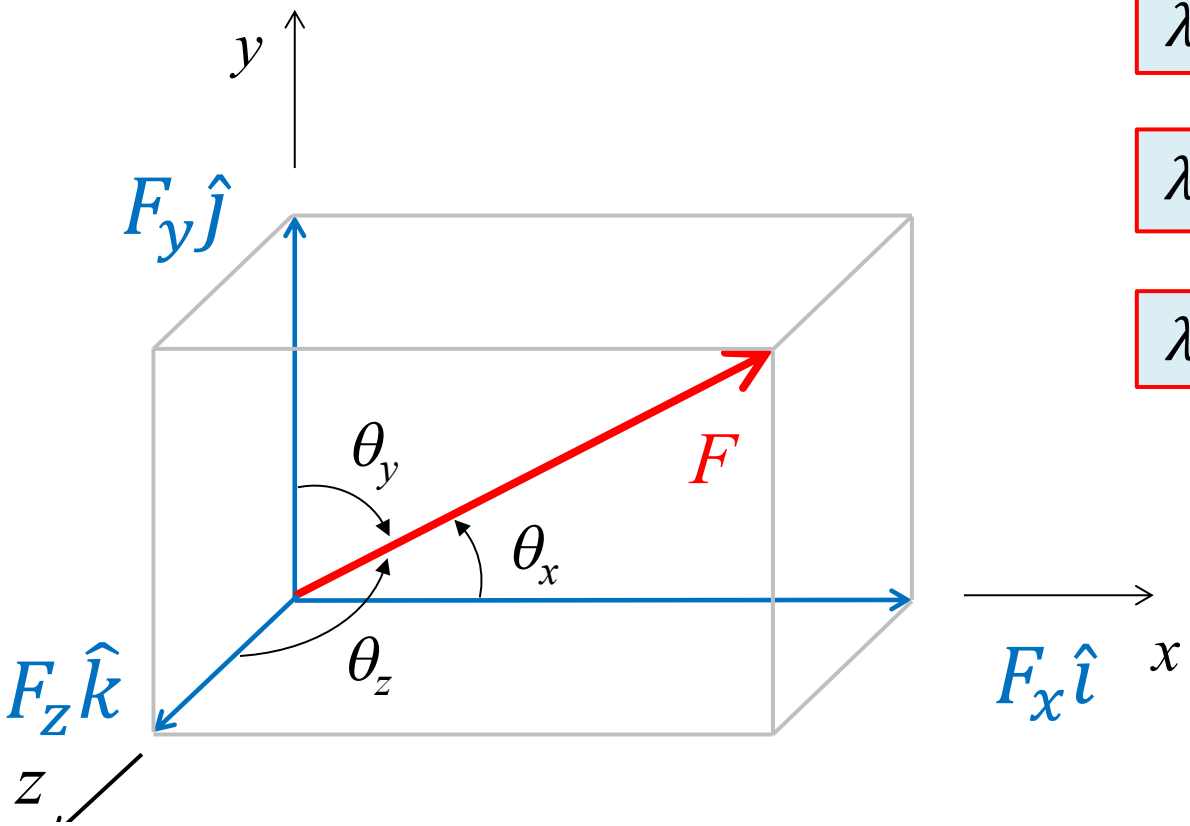
$$\boldsymbol{F} = F_x\hat{\imath} + F_y\hat{\jmath} + F_z\hat{k}$$

Direction of $\boldsymbol{F}$ is defined by direction cosines

$$\lambda_x = \cos\theta_x$$

$$\lambda_y = \cos\theta_y$$

$$\lambda_z = \cos\theta_z$$



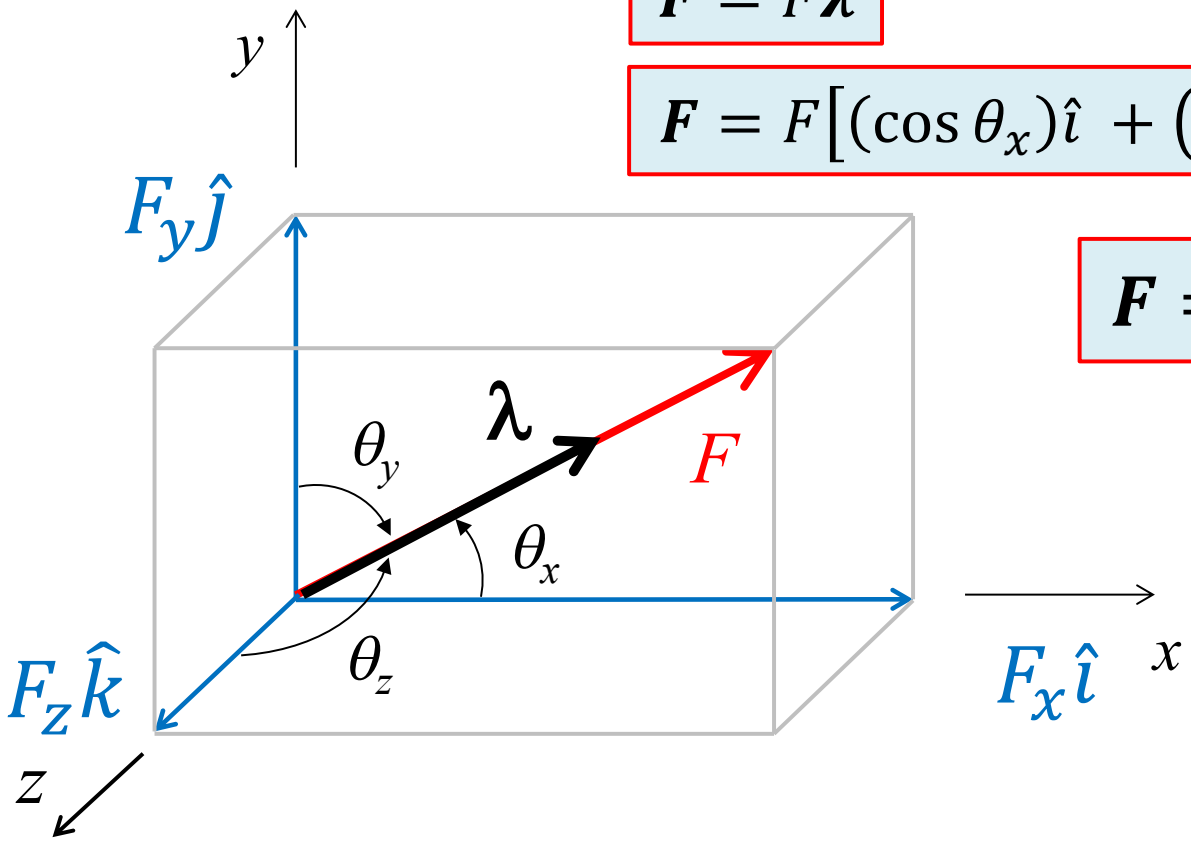
Rectangular Components of a Force in Three-Dimensional Space

unit vector in the direction of $\boldsymbol{F}$

$$\boldsymbol{\lambda} = (\cos\theta_x)\hat{\imath} + (\cos\theta_y)\hat{\jmath} + (\cos\theta_z)\hat{k}$$

$$\boldsymbol{F} = F\boldsymbol{\lambda}$$

$$\boldsymbol{F} = F\left[(\cos\theta_x)\hat{\imath} + (\cos\theta_y)\hat{\jmath} + (\cos\theta_z)\hat{k}\right]$$



$$\boldsymbol{F} = F_x\hat{\imath} + F_y\hat{\jmath} + F_z\hat{k}$$

$$F_x = F\cos\theta_x$$

$$F_y = F\cos\theta_y$$

$$F_z = F\cos\theta_z$$