Lecture 7

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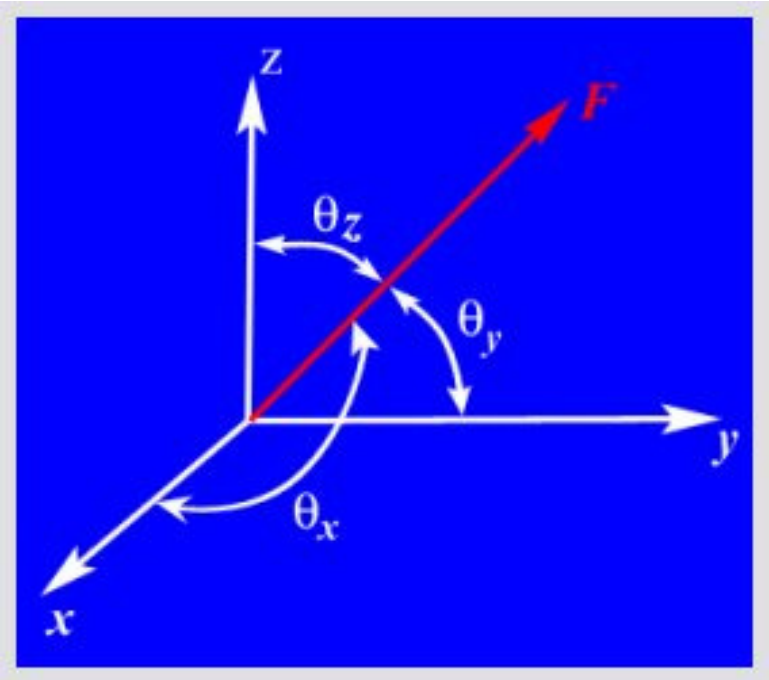
Direction Cosines



$$F_x = F \cos \theta_x \qquad F_y = F \cos \theta_y$$

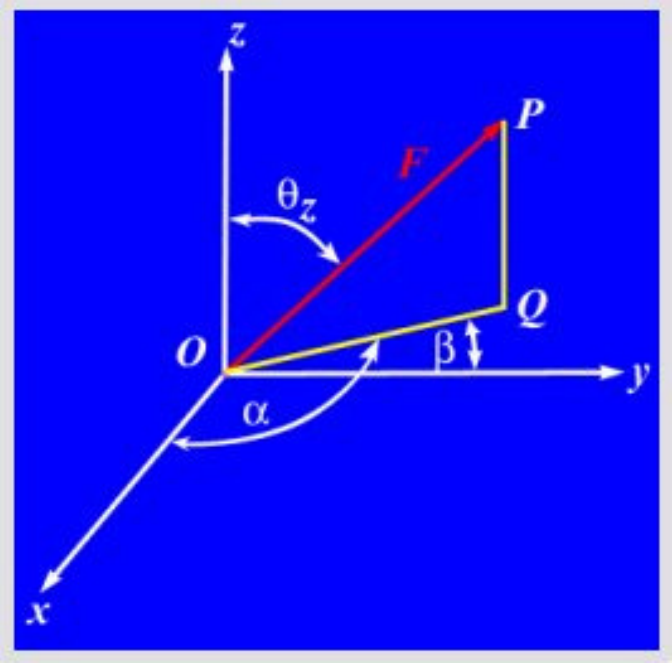
$$F_z = F \cos \theta_z$$

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

Direction Cosine Problems

1. A 500lb force makes 60^o angle with the x-axis and a 40^o angle with the y-axis. The force has a negative z-component. Write the force as a vector.
2. A force has components (200,-700,800). Find the magnitude of the force and the three direction cosines.

Polar Coordinates



$$F_z = PQ = F\cos\theta_z$$

$$OQ = F\cos\left(\frac{\pi}{2} - \theta_z\right)$$

$$F_x = OQ\cos\alpha$$

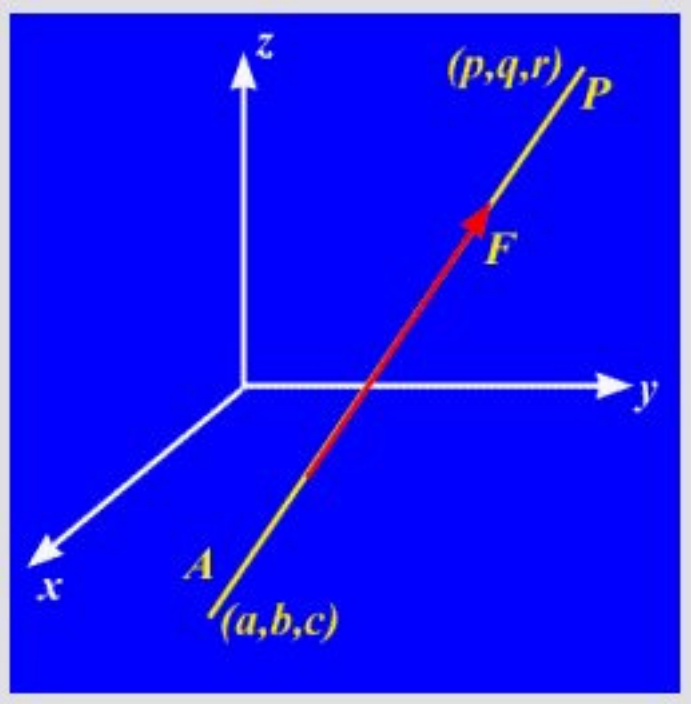
$$F_y = OQ\cos\beta$$

Q is the foot of the perpendicular drawn from the tip P on the xy-plane.

Polar Coordinates Problems

1. A 600lb force makes 120^o angle with the z-axis; $\alpha = 120^o$ and $\beta = 30^o$. Write the force as a vector.

Vector Along a Line



$$\overrightarrow{AP} = (p-a)\hat{i} + (q-b)\hat{j} + (r-c)\hat{k}$$

$$\hat{n}_{AP} = \frac{\overrightarrow{AP}}{|\overrightarrow{AP}|} \qquad \vec{F} = F\hat{n}_{AP}$$

Line Problems

1. A 500lb force is applied along a cable tied between the points A(7,3,-9) and P(12,-6,5). Write the force as a vector.
2. A 500lb force is applied along a cable tied between the points A(0,5,2) and P(12,0,0). Write the force as a vector.