General Physics - Physics 101 Prof. Bob Ekey

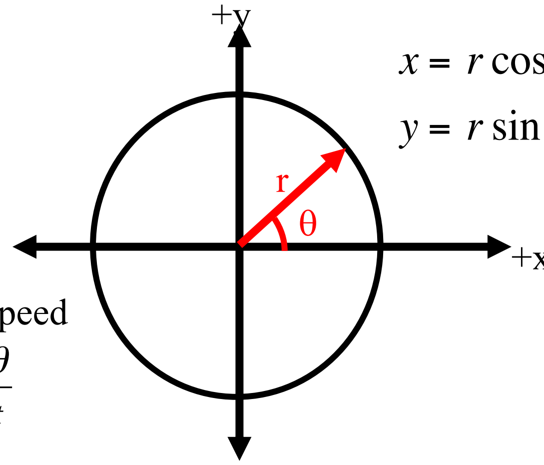
Test #2

Angular Displacement

$$\Delta\theta = \theta - \theta_o$$

Arc Length

$$s = r\Delta\theta = r\theta \;\; (typically \;\; \theta_o = 0)$$



$$x = r\cos\theta$$

$$y = r\sin\theta$$

Average Angular Speed

$$\omega_{avg} = \frac{\Delta\theta}{\Delta t}$$

Instantaneous Angular Speed

$$\omega = \lim_{\Delta t \to 0} \frac{\Delta\theta}{\Delta t} = \frac{d\theta}{dt}$$

Angular speed in terms of Period and Frequency

$$\omega = \frac{2\pi}{T} = 2\pi f$$

Period/Frequency

$$f = \frac{1}{T}$$

Average Angular Acceleration

$$\alpha_{avg} = \frac{\Delta\omega}{\Delta t}$$

Tangential speed

$$v_t = r\omega$$

Tangential speed for uniform circular motion

$$v = \frac{2\pi r}{T}$$

magnitude of tangential acceleration

$$a_t = r\alpha$$

Angular Kinematic Equations

$$\theta_f = \theta_i + \omega_i \Delta t + \tfrac{1}{2}\alpha(\Delta t)^2 \qquad \omega_f = \omega_i + \alpha(\Delta t) \qquad \omega_f^2 = \omega_i^2 + 2\alpha\Delta\theta$$

Centripetal (radial) Acceleration

$$a_c = \frac{v^2}{r} = \frac{(r\omega)^2}{r} = r\omega^2$$

Total Acceleration for circular motion

$$a = \sqrt{a_r^2 + a_t^2}$$

Newton's 2nd Law:

$$\vec{a} = \frac{\vec{F}_{net}}{m} \qquad \vec{F}_{net} = m \cdot \vec{a}$$

Weight/Force of gravity

$$F_g = mg$$

Net force $\vec{F}_{net} = \sum \vec{F}_i = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4 \ldots$

$$\vec{F}_{net,x} = \sum \vec{F}_{i,x} \quad and \quad \vec{F}_{net,y} = \sum \vec{F}_{i,y}$$

Static Friction

$$f_{s\ \max} = \mu_s n$$

Kinetic Friction

$$f_k = \mu_k n$$

Rolling

$$f_r = \mu_r n$$

Newton III law pair

$$\vec{F}_{A\ on\ B} = -\vec{F}_{B\ on\ A}$$

Gravitational Attraction

$$F_{1\ on\ 2} = F_{2\ on\ 1} = \frac{Gm_1 m_2}{r^2}$$

$G = 6.67 \times 10^{-11}\ Nm^2 / kg^2$

TABLE 6.1 Coefficients of friction

Materials	Static μ_s	Kinetic μ_k	Rolling μ_r
Rubber on dry concrete	1.00	0.80	0.02
Rubber on wet concrete	0.30	0.25	0.02
Steel on steel (dry)	0.80	0.60	0.002
Steel on steel (lubricated)	0.10	0.05	
Wood on wood	0.50	0.20	
Wood on snow	0.12	0.06	
Ice on ice	0.10	0.03	