

141 Equations

Linear Kinematics

$$v_{\text{ave}} = x/t$$

$$a_{\text{ave}} = v/t$$

$$v = v_o + at$$

$$x = \frac{1}{2}(v_o + v)t$$

$$x = v_o t + \frac{1}{2}at^2$$

$$v^2 = v_o^2 + 2ax$$

$$t_{\text{fall}} = \sqrt{\frac{2y_{\text{max}}}{g}}$$

$$t_{\text{rise}} = v_o/g$$

$$R = \frac{v_o^2 \sin(2\theta_o)}{g}$$

Rotational Kinematics

$$v = 2\pi r/T$$

$$a_c = v^2/r$$

Linear Dynamics

$$F_{\text{net}} = ma$$

$$F_{\text{net}} = 0 \text{ (eqlb.)}$$

$$W = mg = \frac{GM_E m}{R_E^2}$$

$$\tan\theta_{\text{lean}} = \frac{a_x}{g} \text{ (linear accel.)}$$

$$p = mv$$

$$p = m v$$

$$F_{\text{net}} = \frac{p}{t}$$

$$J = F t = p$$

$$F_k = \mu_k N$$

$$F_{s,\text{max}} = \mu_s N$$

$$e = \frac{-v_{\text{rel},f}}{v_{\text{rel},i}}$$

$$W = Fd \cos(\theta)$$

$$P = \frac{W}{t}$$

Rotational Dynamics

$$\tau = FL$$

$$\tau_{\text{net}} = 0 \text{ (eqlb.)}$$

$$\tan\theta_{\text{lean}} = \frac{v^2}{gr} \text{ (circ. motion)}$$

Conversions and Constants

$$1 \text{ yd} = 36 \text{ in}$$

$$1 \text{ m} = 39.37 \text{ in}$$

$$1 \text{ mile} = 1.61 \text{ km} = 1610 \text{ m} = 1760 \text{ yd}$$

$$1 \text{ mi/hr} = 1.61 \text{ km/hr} = 0.447 \text{ m/s}$$

$$1 \text{ knot} = 1.151 \text{ mi/hr} = 0.514 \text{ m/s}$$

$$1 \text{ kg weighs } 9.8 \text{ N or } 2.20 \text{ lb}$$

$$1 \text{ lb} = 4.45 \text{ N}$$

$$1 \text{ ft-lb} = 1.36 \text{ J}$$

$$1 \text{ cal} = 4.186 \text{ J}$$

$$1 \text{ BTU} = 252 \text{ cal} = 1055 \text{ J}$$

$$1 \text{ hp} = 746 \text{ W}$$

$$2 \text{ rad} = 360^\circ = 1 \text{ rev}$$

$$1 \text{ rad} = 57.3^\circ$$

$$T_F = (9/5)T_C + 32$$

$$g = 9.8 \text{ m/s}^2 = 32 \text{ ft/s}^2$$

$$N_A = 6.02 \times 10^{23} / \text{mole}$$

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