TABLE 10.1 A Comparison of Equations for Rotational and Translational Motion: Kinematic Equations

$\omega = \frac{d\theta}{dt}$

$\alpha = d\omega/dt$

$v = dx/dt$ & $a = \frac{dv}{dt}$

Rotational Motion About a Fixed Axis with α = Constant (Variables: θ_f and ω_f)	Translational Motion with a = Constant (Variables: x_f and v_f)
$\omega_f = \omega_i + \alpha t$	$v_f = v_i + at$
$\theta_f = \theta_i + \omega_i t + \frac{1}{2}\alpha t^2$	$x_f = x_i + v_i t + \frac{1}{2}at^2$
$\theta_f = \theta_i + \frac{1}{2}(\omega_i + \omega_f)t$	$x_f = x_i + \frac{1}{2}(v_i + v_f)t$
$\omega_f^2 = \omega_i^2 + 2\alpha(\theta_f - \theta_i)$	$v_f^2 = v_i^2 + 2a(x_f - x_i)$

TABLE 10.3 A Comparison of Equations for Rotational and Translational Motion: Dynamic Equations[a]

	Rotational Motion About a Fixed Axis	Translational Motion
Kinetic energy	$K_R = \frac{1}{2}I\omega^2$	$K = \frac{1}{2}mv^2$
Equilibrium	$\sum \tau = 0$	$\sum \mathbf{F} = 0$
Newton's second law	$\sum \tau = I\alpha$	$\sum \mathbf{F} = m\mathbf{a}$
Newton's second law	$\sum \boldsymbol{\tau} = \frac{d\mathbf{L}}{dt}$	$\sum \mathbf{F} = \frac{d\mathbf{p}}{dt}$
Momentum	$L = I\omega$	$\mathbf{p} = m\mathbf{v}$
Conservation principle	$L_i = L_f$	$\mathbf{p}_i = \mathbf{p}_f$
Power	$\mathcal{P} = \tau\omega$	$\mathcal{P} = Fv$

[a] Equations in translation motion expressed in terms of vectors have rotational analogs in terms of vectors. Because the full vector treatment of rotation is beyond the scope of this book, however, some rotational equations are given in nonvector form.