

SUMMARY DYNAMICS MODULE N1

SUBJECT	EQUATION	DISCUSSION
Rectilinear Velocity	$v = \frac{dx}{dt}$ $a = \frac{dv}{dt} = \frac{d^2x}{dt^2}$ $a = v \frac{dv}{dx}$	General equations, where generally $x=f(t)$ and differentiation yields velocity and acceleration.
$a = f(t)$	$v - v_0 = \int f(t) dt$ $x - x_0 = \int [v_0 + \int f(t) dt] dt$	Acceleration is given as a function of time. Integration yields velocity and displacement equations with v_0 and x_0 are determined by boundary conditions.
$a = f(x)$	$v dv = a dx$ $\int v dv = \int f(x) dx$ $\frac{v^2 - v_0^2}{2} = \int_{x_0}^x f(x) dx$	Integration yields a relationship between velocity and displacement.
$a = f(v)$	$\frac{dv}{dt} = a = f(v)$ $\int \frac{dv}{f(v)} = \int dt$ or $v \frac{dv}{dx} = a = f(v)$ $\int \frac{v dv}{f(v)} = \int dx$	A relationship between velocity and time or velocity and displacement may be obtained by a single integration.
$v = \text{const.}$	$x = x_0 + vt$	
$a = \text{const.}$	$v = v_0 + at$ $x = x_0 + v_0 t + \frac{1}{2} at^2$ $v^2 = v_0^2 + 2a (x - x_0)$	