Dynamics Process Guidesheet

Topic

Kinematics of a Particle: Rectangular Coordinates

Governing Equations and Assumptions

$v = \frac{ds}{dt}$, $a = \frac{dv}{dt}$, $a\,ds = v\,dv$

$v = v_0 + a_c t$
$s = s_0 + v_0 t + \frac{1}{2} a_c t^2$
$v^2 = v_0^2 + 2a_c(s - s_0)$

} Constant Acceleration

Process

① Is the acceleration constant?
Yes => Constant Acceleration Formulas
No => Use the differential relations

② Determine the function(s) for one quantity (s, v, a) in terms of time or position

③ Apply the Kinematics Expressions for each function
=> Account for initial conditions
— Lower Limit of the integral
=> Upper Limit => variable
=> Substitute values for time or position at the end (Do the calculus first)
=> time => $a = \frac{dv}{dt}$, $v = \frac{ds}{dt}$
position => $a\,ds = v\,dv$
time and position => all