ENGR-2060
E.M. - DYNAMICS

NAME

DATE

SOLUTIONS

PROBLEM: AP-4

GIVEN:

The acceleration of a particle as it moves along a straight line is given by $a = (2t - 1)\ m/s^2$, where t is in seconds. If $s = 1\ m$ and $v = 2\ m/s$ when $t = 0$, determine the particle's velocity and position when $t = 6\ s$. Also, determine the total distance the particle travels during this time period.

REQUIRED:

$v_6 = ?$

$s_6 = s_{TOTAL} = ?$

SOLUTION:

$$a = 2t - 1 = \frac{dv}{dt}$$

$$\int_{t_0}^{t} 2t - 1\ dt = \int_{v_0}^{v} dv$$

$$t^2 - t = v - v_0$$

$$v = t^2 - t + 2 = \frac{ds}{dt}$$

$$\int_{t_0}^{t} t^2 - t + 2\ dt = \int_{s_0}^{s} ds$$

$$\frac{t^3}{3} - \frac{t^2}{2} + 2t = s - s_0$$

$$s = \frac{t^3}{3} - \frac{t^2}{2} + 2t + 1$$

@ $t = 6$

$v = 32\ m/s$

$s = 67\ m$

$$\boxed{v_6 = 32\ m/s \qquad s_{TOT} = 67\ m}$$