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DEPT: MECHATRONICS ENGINEERING
(MECHANICS ASSIGNMENT)

$v = (4t - 3t^2)$ m/s

Position (s) = ?

Integrating v

$s = \frac{4t^2}{2} - \frac{3t^3}{3}$

$s = 2t^2 - t^3$

at $t = 4$

$s = (2 \times 4^2) - 4^3$

$s = (32 - 64)$m

$s = -32$m ; $s = 32$m ←

$v = (0.5t^3 - 8t)$ m/s

Determine a when $t = 2s$

Differentiating

$\frac{\partial v}{\partial t} = a = (3 \times 0.5t^2 - 8)$ m/s²

$a = (1.5t^2 - 8)$ m/s²

at $t = 2s$

$a = (1.5 \cdot 2^2 - 8) = -2$ m/s²

$a = 2$ m/s² ←

$a = (4t^2 - 2)$ m/s²

$v = \int (4t^2 - 2)\partial t$

$v = \frac{4}{3}t^3 - 2t + C_1$

$s = \int (\frac{4}{3}t^3 - 2t + C_1)\partial t$

$s = \frac{1}{3}t^4 - t^2 + C_1 t + C_2$

at $t = 0$, $s = \frac{1}{3}0^4 - 0^2 + C_1(0) + C_2$

$s = C_2 = -2$

at $t = 2$,

$s = -20$.

~~Thus, $C_2 = -9.7$~~

$-20 = \frac{1}{3}(8) - 4 + 2C_1 - 2$; $C_1 = \frac{-54}{3 \times 2} = -9.7$

at $t = 4$,

$s(4) = \frac{1}{3} \cdot 4^4 - 4^2 + (-2)4 - 9.7$

$s = 28.7$m

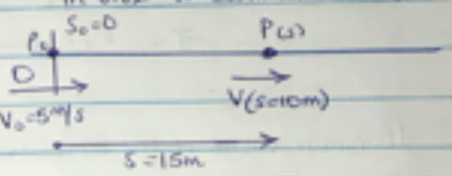
4. $v = (20 - 0.05s^2)$ m/s

$a = ?$ when $s = 15$m

~~$s = \int (20 - 0.05s^2)\partial t$~~

$a = \frac{\partial v}{\partial t}$

In order to eliminate time,



Where the original position is point D with the positive motion to the right

$dt = \frac{\partial s}{v}$, $dt = \frac{\partial v}{a}$

$\frac{\partial s}{v} = \frac{\partial v}{a}$

$a = \frac{v\partial v}{\partial s}$ —— ①

Since $v = 20 - 0.05s^2$, $\partial v = -2 \times 0.05 s \partial s$

$\partial v = -0.1s \partial s$ —— ②

Substituting ② into ①

$a = \frac{(20 - 0.05s^2)(-0.1s)\partial s}{\partial s}$

$a = -2s + 0.005s^3$

But $s = 15$

$a = -2(15) + 0.005(15)^3$

$a = -18.125$ m/s²

Since the motion is positive to the right, acceleration vector is directed to the left

$a = 18.125$ m/s² ←
$a > 0$