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1BENG05062
MECHANICS
MECHATRONICS ENG.

F12-3

① $V = (4t - 3t^2)$ m/s

determine the position

$t = 4$ sec

$S = 0$ when $t = 0$

$V = \frac{ds}{dt}$

$= 4t - 3t^2$

$\int_0^S ds = \int_0^t (4t - 3t^2)\, dt$

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

Recall $t = 4$ s

$S = 2(4)^2 - (4)^3$

$S = 32 - 64$

$S = -32$ m

F12-4

② $V = (0.5t^3 - 8t)$ m/s

$t = 2$ s

Determine the acceleration

$a = \frac{dV}{dt} = \frac{d}{dt}(0.5t^3 - 8t)$

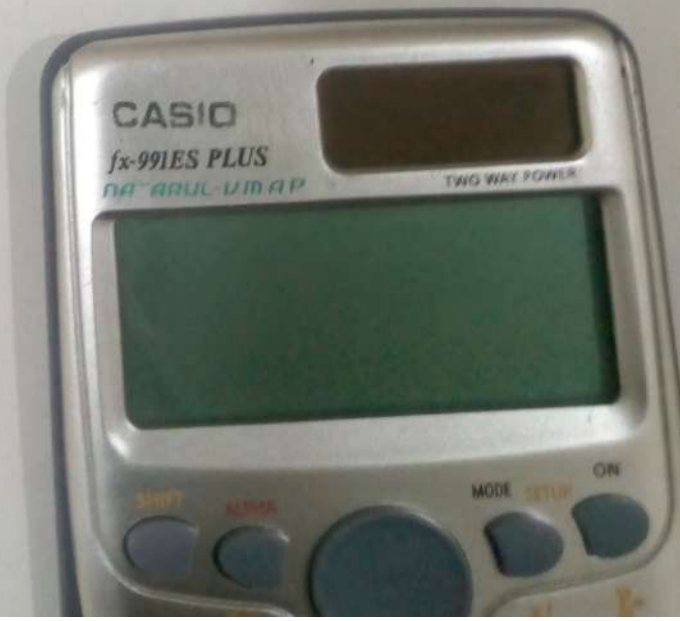
$= 1.5t^2 - 8$

Recall $t = 2$ s

$a = 1.5(2)^2 - 8$

$a = 6 - 8$

$a = -2$ m/s^2



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MECHANICS

③ F12-8

$a = (20 - 0.05s^2)\ m/s^2$

$s = 15m$

Determine the acceleration

$a = \frac{dv}{dt} = -0.1s \frac{ds}{dt}$

$\frac{ds}{dt} = v$

$a = -0.1s \times v = 0.1s(20 - 0.05s^2)$

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

at $s = 15$

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

$a = -30 + 16.875$

$a = -13.125\ m/s^2$

$\underline{\sim} -13.13\ m/s^2$

F12-7

④ $a = (4t^2 - 2)$

$v = 4/3\,t^3 - 2t + c_1$

$= \frac{4}{12}t^4 - t^2 = \frac{1}{3}t^4 = t^2 + C_2$

When $t = 0$ located 2m to the left

$-2 = \frac{1}{3}(0)^4 - 0^2 + C_1 \cdot 0 + C_2$

$-2 = C_2$

$C_2 = -2$

When $t = 2$, $s = 20m$

$-20 = \frac{1}{3}(2)^3 - 2^2 + 2 \cdot C_1 - 2$

$-18 = \frac{8}{12} - 4 + 2C_1$

$C_1 = -9.667$

$\underline{\sim} -9.67$

Using C_1 and C_2

$\frac{4}{12}4^4 - 4^2 - (4 \cdot 9$

$= 28.667$

$s = 28.667m$