$x(t)$; $v = \frac{dx}{dt}$; $a = \frac{d^2x}{dt^2}$

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$a = \frac{dv}{dt}$

② A particle moves along x-axis so that its co-ordinates obey the expression (law) $x(t) = 2t^2 + 4$ where x is in meter & t is in seconds.

→ find particle velocity
→ find particle acceleration

$x(t) = 2t^2 + 4$

diff w.r.to t we get

$\boxed{v = \frac{dx}{dt} = 4t} + 0$

diff again w.r.to t we get

$\frac{dv}{dt} = \boxed{a = 4\ m/sec^2}$

*find v at $t = 1$ sec

$\boxed{v = 4\ m/sec}$

③ A particle moves along x-axis according to the eqn $x(t) = 2t^3 + 6t^2 - 6t + 1$ when $t \geq 0$ and is measured in sec.

Find the time taken by the particle when $v(t)$ & $a(t)$ are equal

$x(t) = 2t^3 + 6t^2 - 6t + 1$

diff. w.r. to t

$\boxed{v = 6t^2 + 12t - 6}$ —— ①

diff v w.r.to t

$\boxed{a = 12t + 12}$ —— ②

given $v(t) = a(t)$

① & ② are equal

$6t^2 + 12t - 6 = \underbrace{12t + 12}$

$6t^2 \cancel{+12t} \cancel{-12t} - 6 - 12 = 0$

$6t^2 - 18 = 0$

$6t^2 = 18 \quad \div 6$

$\frac{\cancel{6}t^2}{\cancel{6}} = \frac{\cancel{18}^{3}}{\cancel{6}_{1}}$

$t^2 = 3$

sq. root on both sides

$t = \pm\sqrt{3}$ [take +ve]

$\boxed{t = \sqrt{3} \text{ sec}}$

① $x(t) = -\frac{t^3}{6} + 2t^2 - 1$

x is in meters & t is in secs

find t when $a(t) = 0$.

$x(t) = -\frac{t^3}{6} + 2t^2 - 1$

diff. w.r.to t.

$v = -\frac{1}{6}(3t^2) + 4t - 0$

diff. v w.r.to t

$a = -\frac{1}{\cancel{6}}(\cancel{6}t) + 4$

$\boxed{a = -t + 4}$

given $a(t) = 0$

$-t + 4 = 0$

$+t = +4$

$\boxed{t = 4 \text{ secs}}$

$x(t) = t\ln(t)$ find $a(t)$.

when $v(t) = 0$

$\rightarrow v(t)$

$\rightarrow v(t) = 0$ find t

$\rightarrow a(t)$

$\Rightarrow a(t)$ $t = ?$

$$\log_e(t) = -1$$

$$t = e^{-1}$$

$$t = \frac{1}{e}$$

$$t = \frac{1}{2.7138}$$

$$\boxed{t = 0.368 \text{ sec}}$$

$$a(t) = \frac{1}{t} = \frac{1}{0.368}$$

$$\boxed{a(t) = 2.7138 \text{ m/sec}^2}$$

$* \log_a x = m$

$x = a^m$

$e = 2.7138$

Integration

$\int k\,dx$	kx
$\int 1\,dx$	x
$\int x^n\,dx$	$\frac{x^{n+1}}{n+1}$
$\int e^{ax}\,dx$	$\frac{e^{ax}}{a}$
$\int a^x\,dx$	$\frac{a^x}{\log a}$

probs on integration

① $\int x^2 dx = \frac{x^3}{3}$

② $\int x^{-4} dx = \frac{x^{-4+1}}{-4+1} = \frac{x^{-3}}{-3} = -\frac{1}{3x^3}$

③ $\int \sqrt{x}\, dx = \int x^{1/2} dx = \frac{x^{\frac{1}{2}+1}}{\frac{1}{2}+1} = \frac{x^{\frac{3}{2}}}{(3/2)}$

④ $\int x^{2/3} dx$ $= \frac{x^{2/3+1}}{2/3+1} = \frac{x^{5/3}}{(5/3)}$ $= \frac{2}{3} \cdot x^{3/2}$

⑤ $\int$

② $\int\left(-6x^3+9x^2+4x-3\right)dx$

③ $\int\left(\frac{8}{x}-\frac{5}{x^2}+\frac{6}{x^3}\right)dx$

④ $\int\left(\sqrt{x}+\frac{1}{3\sqrt{x}}\right)dx$

⑤ $\int\frac{1}{x\sqrt{x}}\,dx$