3. $v(t) = 3t^2 - 2t$ $\quad (3, 12)$

on position function

$s(3) = 12$

find $s(t) =$

$$\boxed{s(t) = t^3 - t^2 - 6}$$

$$\int (3t^2 - 2t)\,dt$$

$$= \int 3t^2\,dt + \int -2t\,dt$$

$$= 3\int t^2\,dt - 2\int t\,dt$$

$$= 3\left(\tfrac{1}{3}\right)t^3 - 2\left(\tfrac{1}{2}\right)t^2 + C$$

$$= t^3 - t^2 + C$$

$$12 = (3)^2 - (3)^2 + C$$

$$-6 = C$$

5. $v(t) = 20 - 5t$

a) $a(t) = -5\,ms^{-2}$

b) $(0, 5)$ $\qquad s(t) = 20t - \frac{5}{2}t^2 + 5$

$$s(t) = \int (20 - 5t)\,dt$$

$$= \int 20\,dt - \int 5t\,dt$$

$$= 20t - 5\left(\tfrac{1}{2}\right)t^2 + C$$

$$= 20t - \frac{5}{2}t^2 + C$$

$$5 = \cancel{20(0) - \frac{5}{2}(0)^2} + C$$

$$5 = C$$

9.2 More on Indefinite Integrals

lol "moron" shmoo

If $\int x^n dx = \frac{1}{n+1} x^{n+1} + C$, what about $\int x^{-1} dx$

$$\int x^{-1} dx = \frac{1}{-1+1} x^{-1+1} = \frac{1}{0} x^0 \text{ DNE}$$

$$f(x) = x^{-1} = \frac{1}{x}$$

$$\frac{dy}{dx} \ln(x) = \frac{1}{x}$$

$$\boxed{\therefore \int x^{-1} dx = \ln(x) + C}$$

and

$$\boxed{\int e^x dx = e^x + C}$$

Ex) $\int \frac{4}{x} dx = 4 \int \frac{1}{x} dx = 4 \ln(x) + C$

Ex) $\int \frac{e^t}{2} dt = \frac{1}{2} \int e^t dt = \frac{1}{2} e^t + C$

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

$= \int 3x\,dx + \int 2dx + \int \frac{1}{x} dx$

$= \frac{3}{2}x^2 + 2x + \ln(x) + C$

Ex) $\int \ln(e^{2t-1}) dt = \int (2t-1) dt$

$= \int 2t\,dt - \int 1dt$

$= 2(\frac{1}{2})t^2 - t + C$

$= t^2 - t + C$

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2-10 even