4.9

Note Title 11/20/2007

<u>Defn</u>

A function F is called an <u>antiderivative</u> of f on an interval I if $F'(x) = f(x)$ $\forall x \in I$

<u>Thm</u>

Antiderivative of f on I is

$$F(x) + C$$

where C is an arbitrary constant

ex. The antiderivative of $f(x) = x^2$ is $\frac{x^3}{3} + C$

because $\frac{d}{dx}\frac{x^3}{3} = x^2$

ex. Antiderivative of $\cos x$ is $\sin x + C$

ex. Antiderivative of $1/x$ is $\ln|x| + C$

See table on pg. 329

note: antiderivative of x^n is

$$\frac{x^{n+1}}{n+1} + C$$

ex. find antiderivative

$$g(x) = \frac{5 - 4x^3 + 2x^6}{x^6}$$

$$= 5x^{-6} - 4x^{-3} + 2$$

$$G(x) = \frac{5}{-5}x^{-5} - \frac{4}{-2}x^{-2} + 2x + C$$

$$= -x^{-5} + 2x^{-2} + 2x + C$$

If I told you that $G(1) = 5$, you could find C.

ex. from above

$$G(1) = -(1)^{-5} + 2(1)^{-2} + 2(1) + C = 5$$

$$3 + C = 5$$

$$G(x) = -x^{-5} + 2x^{-2} + 2x + 5$$

remember, $s'(t) = v(t)$ and $v'(t) = a(t)$

antiderivative of $a(t)$ is $v(t)$

" " $v(t)$ is $s(t)$

ex. $a(t) = 5 + 4t - 2t^2$ find $v(t)$ & $s(t)$

let $v(0) = 3$ & $s(0) = 10$

$$v(t) = 5t + \frac{4}{2}t^2 - \frac{2}{3}t^3 + C \Rightarrow C = 3$$

$$s(t) = \frac{5}{2}t^2 + \frac{4}{6}t^3 - \frac{2}{12}t^4 + 3t + C_1 \Rightarrow C_1 = 10$$

$$= \frac{5}{2}t^2 + \frac{2}{3}t^3 - \frac{1}{6}t^4 + 3t + 10$$

hw hint:

acceleration of a dropped object is $-9.8\ m/s^2$