ANTIDERIVATIVES

A function F is an antiderivative of f if $F'(x) = f(x)$ (for all x on a given interval)

For Example:

If $f(x) = 2x$ $F(x) = x^2$

since $F'(x) = 2x = f(x)$

$f(x) = \frac{1}{2}x^{-1/2}$ $F(x) = \sqrt{x}$ or $x^{1/2} + C$ (+1)

$f(x) = \frac{3}{5}x^2$ $F(x) = \frac{1}{5}x^3 + C$ (+1)

$f(x) = x^6$ $F(x) = \frac{1}{7}x^7 + C$

If $f(x) = x^n$, $F(x) = \frac{x^{n+1}}{n+1} + C$

$f(x) = 4x^3 - 6x^2 + 11$

$F(x) = x^4 - 2x^3 + 11x + C$

Check: $F'(x) = 4x^3 - 6x^2 + 11 = f(x)$ ✓

$f(x)$	$F(x)$
0	C
1	$x + C$
x^n	$\frac{x^{n+1}}{n+1} + C$
e^{kx}	$\frac{1}{k}e^{kx} + C$
$\cos kx$	$\frac{1}{k}\sin(kx) + C$
$\sin kx$	$-\frac{1}{k}\cos kx + C$
$2x^2 - x + 7$	$\frac{2x^3}{3} - \frac{1}{2}x^2 + 7x + C$
$\frac{2}{x^2} - \frac{5}{x} + x$	?
$2x^{-2} - 5\left(\frac{1}{x}\right) + x$	$\frac{2x^{-1}}{-1} - 5 \cdot \ln x + \frac{1}{2}x^2 + C$ $= -\frac{2}{x} - 5\ln x + \frac{1}{2}x^2 + C$
$2^x \ln 2$	$2^x + C$
$f(x) = \sin x \cos x$	$\frac{1}{2}\sin^2 x + C$
$\cos x \cdot \sin x$	$-\frac{1}{2}\cos^2 x + C$

How do we find 'c' ?

$\Rightarrow$ to find c, we need some more info.

Ex: Find $F(x)$ if $f(x) = 2x$ when $F(x) = 3$ and $x = 0$

$$F(x) = x^2 + C$$

$$3 = (0)^2 + C$$

$$C = 3$$

so: $F(x) = x^2 + 3$

$\boxed{\text{Now do } 9.1 \,\&\, 9.2}$