Math 1210 #22
Antiderivatives

Definition: Antiderivative

We call F an antiderivative of f on the interval, I, if

$D\_xF(x) = f(x)$ on I.

ie. If $F'(x) = f(x)$ for all x on the interval.

Power Rule Theorem

For every real value of r except $r = -1$, then

$$\int x^r dx = \frac{x^{r+1}}{r+1} + C$$

Indefinite Integral is a linear operator.

EX 1

Evaluate the following integrals.

1a)

$\int (2x^4 + 3x^2 - 7)dx$

1b)

$\int (u^3 - u^9)du$

EX 2

Evaluate the following integrals.

2a)

$\int \left(\frac{1}{y^2} + y^{\frac{1}{3}}\right) dy$

2b)

$\int \left(x^{-4} + \sqrt[3]{x^2} - \frac{3}{x^5}\right) dx$

Theorem

$$\int \sin\ xdx = -\cos\ x + C$$
$$\int \cos\ xdx = \sin\ x + C$$

EX 3

$$\int \quad (t^2 - 2cos\ t)dt$$

Generalized Theorem

Let g be differentiable and r a rational number, $r \neq -1$, then

$$\int [g(x)]^r g'(x)dx = \frac{[g(x)]^{r+1}}{r+1} + C$$

EX 4

$$\int \quad (4x^3 + 1)^4 12x^2 dx$$

EX 5

$$\int (5x^2 + 1)\sqrt{5x^3 + 3x - 2}dx$$

EX 6

$$\int \frac{3y}{\sqrt{2y^2 + 5}}dy$$

Function $f(x)$	Antiderivative $F(x)$
1	x
$2x$	x^2
x^3	$\frac{1}{4}x^4$
$\cos\ x$	$\sin\ x$
$\sin\ 2x$	$-\frac{1}{2}\cos\ 2x$