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**VIRTUAL COACHING CLASSES  
ORGANISED BY BOS (ACADEMIC), ICAI**

**FOUNDATION LEVEL  
PAPER 3: BUSINESS MATHEMATICS, LOGICAL  
REASONING & STATISTICS  
(REVISION SESSION - 2 )**

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# Discussion flow :

- Review session - 2
- Integral calculus

# Integration

$$\int f(x)dx$$

Integration is the **reverse process of differentiation.**

## Anti-derivative

Integration is the **inverse operation of differentiation** and denoted by the symbol :  $\int$  :

The symbol is a stylized  $\int$  to indicate summation

Integral calculus was primarily invented **to determine the area bounded by the curves dividing the entire area into infinite number of infinitesimal small areas** and taking the sum of all these small areas.

# Definition of anti-derivative

- Formally, we define the **anti-derivative** as: If  $f(x)$  is a continuous function and  $F(x)$  is the function whose derivative is  $f(x)$ , i.e.:  $F'(x) = f(x)$ , then:

$$\int f(x) dx = F(x) + c; \text{ where } c \text{ is any arbitrary constant.}$$

# 8.B.4 : INTEGRATION BY PARTS

## Integration by Parts

$$\int u dv = uv - \int v du$$

Choose  $u$  in this order: **LIATE**

**L**ogs

**I**nverse

**A**lgebraic

**T**rig

**E**xponential

$$\int u v dx$$

$u' \int v dx$

$$u \int v dx - \int u' (\int v dx) dx$$

$$\int f'(x)f(x)dx = \frac{1}{2}(f(x))^2 + C$$

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

## Example

Find  $\int x \ln |x| dx$ .

Then, applying the formula

$$\begin{aligned}\int x \ln |x| dx &= \frac{x^2}{2} \ln |x| - \int \frac{x^2}{2} \cdot \frac{1}{x} dx \\ &= \frac{x^2}{2} \ln |x| - \int \frac{x}{2} dx \\ &= \frac{x^2}{2} \ln |x| - \frac{x^2}{4} + c\end{aligned}$$

where  $c$  is the constant of integration.



# MTP : Integration by parts – ILATE

- . Int  $x^3 \log x \, dx$ ,
- let  $u = x^3$ ,  $v = \log x$
- $X^4/ 16 ( 4 \log x - 1) + k$

# Example : MTP

- Find the equation of the curve where slope at (x, y) is  $9x$  and which passes through the origin.
- **Solution:**
- $Dy/ dx = 9x$
- $\int dy = \int 9x dx$  or  $y = \frac{9x^2}{2} + c$
- Since it passes through the origin,  $c = 0$ ; thus required eqn . is  $9x^2 = 2y$ .

## MTP question

- . If  $f'(x) = x-1$ , the equation of a curve  $y = f(x)$  passing through the point  $(1, 0)$  is given by
- $= x^2/2 - x + k$  , at  $1, 0$  ....  $K = 1/2$
- So eqn :  $y = x^2/2 - x + 1/2$

# MTP Oct 2020

■ 40. If  $f'(x) = 3x^2 + 2$  and  $f(0) = 0$ , find  $f(2)$

(a) 5

(b) 8

(c) 10

(d) 12

# MTP 2021

- 39. Evaluate :  $\int \frac{2x+1}{x(x+1)} dx$
- Let  $x^2+x = p$
- Etc

# MTP 2021

- 40. Evaluate  $\int_0^2 x^5 dx$  between 0 to 2



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**THANK YOU**