

# Mat 104 Assignment

Matric Number: 19/MTS01/284

Department: MBBS

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$$1) \int \frac{11-3x}{x^2+2x-3} dx = \int \frac{11-3x}{(x-1)(x+3)}$$

$$11-3x = A + B$$

$$x^2+2x-3 \quad (x-1) \quad (x+3)$$

$$\frac{11-3x}{x^2+2x-3} = \frac{A(x+3) + B(x-1)}{(x-1)(x+3)}$$

Divide through by  $(x-1)(x+3)$

$$11-3x = A(x+3) + B(x-1)$$

When  $x = -3$

$$11-3(-3) = B(-3-1)$$

$$11+9 = -4B$$

$$B = 20/-4$$

$$B = -5$$

When  $x = 1$

$$11-3(1) = A(1+3)$$

$$8 = 4A \quad \therefore A = 2$$

$$\int \frac{11-3x}{(x-1)(x+3)} = \frac{2}{(x-1)} + \frac{-5}{(x+3)}$$

$$\int \frac{1-3x}{x^2+2x-3} dx = 2 \ln|x-1| - 5 \ln|x+3| + C$$

$$2) \int \frac{4x-16}{x^2+2x-3} dx = \int \frac{4x-16}{(x-3)(x+3)} dx = \frac{A}{x-3} + \frac{B}{x+3}$$

$$\frac{A(x+3) + B(x-3)}{(x-3)(x+3)} = \frac{4x-16}{(x-3)(x+3)}$$

Multiply through by  $(x-3)(x+3)$

$$A(x+3) + B(x-3) = 4x-16$$

$$Ax + A + Bx - 3B = 4x - 16$$

$$x(A+B) + (A-3B) = 4x - 16$$

$$A+B = 4 \quad \text{--- (1)}$$

$$A-3B = -16 \quad \text{--- (2)}$$

$$4B = 20$$

$$B = 5 \quad \text{--- (3)}$$

sub eqn (3) in (1)

$$A+B = 4$$

$$A+5 = 4 \quad \therefore A = -1$$

$$\therefore \frac{-1}{x-3} dx + \frac{5}{x+3} dx = \int \frac{4x-16}{x^2+2x-3} dx$$

$$\text{Let } u = x-3$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$\text{Let } v = x+3$$

$$\frac{dv}{dx} = 1$$

$$dv = dx$$

$$\therefore \frac{-1 du}{u} + \frac{5 du}{u}$$

$$\ln(x-3) + 5 \ln(x+1)$$

$$\int \frac{4x^2 - 16}{x^2 + 2x - 3} dx = 5 \ln(x+1) - \ln(x-3) + C$$

$$3) \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx$$

$$\frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} = \frac{A}{x+1} + \frac{B}{x-2} + \frac{C}{x+3}$$

$$A[(x-2)(x+3)] + B[(x+1)(x+3)] + C[(x+1)(x-2)]$$

$$\frac{Ax^2 + Ax - 6A + Bx^2 + 4Bx + 3B + Cx^2 - 2Cx - 2C}{(x+1)(x-2)(x+3)}$$

$$\frac{2x^2[A+B+C] + x[A+4B-C] + [-6A+3B-2C]}{(x+1)(x-2)(x+3)}$$

$$A+B+C = 2 \quad \text{--- (1)}$$

$$A+4B-C = -9 \quad \text{--- (2)}$$

$$-6A+3B-2C = -35 \quad \text{--- (3)}$$

$$A = 2 - B - C \quad \text{--- (4)}$$

Sub equ (4) in equ 2 and 3

$$2 - B - C + 4B - C = -9$$

$$2 - B + 4B - C - C = -9$$

$$2 + 3B - 2C = -9$$

$$3B - 2C = -9 - 2$$

$$3B - 2C = -11 \quad \text{--- (5)}$$

$$-6A + 3B - 2C = -35$$

$$-6(2 - B - C) + 3B - 2C = -35$$

$$-12 + 6B + 6C + 3B - 2C = -35$$

$$6B + 3B + 6C - 2C = -35 + 12$$

$$9B + 4C = -23 \quad \text{--- (6)}$$

Solve equ 5 and 6 simultaneously

$$3B - 2C = -11 \quad \text{--- (5)}$$

$$9B + 4C = -23 \quad \text{--- (6)}$$

Multiply equ (5) by 4 and equ (6) by 2

$$12B - 8C = -44$$

$$18B + 8C = -46$$

$$30B = 90$$

$$B = \frac{90}{30} \quad \therefore B = 3 \quad \text{--- (7)}$$

Put equ (7) in 5

$$3B - 2C = -11$$

$$-9 - 2C = -11$$

$$3(-3) - 2C = -11 \quad \therefore -9 - 2C = -11$$

$$-2C = -11 + 9 \quad \therefore -2C = -2 \quad \therefore C = 1 \quad \text{--- (8)}$$

Put equ 7 and 8 in equ 1

$$A + B + C = 2$$

$$A + 3 + 1 = 2 \quad A = 2 + 3 - 1 \quad A = 4$$

$$A - 3 + 1 = 2 \quad A = 2 + 3 - 1 \quad A = 4$$

$$2x^2 - 9x - 25 = \frac{4}{2x+1} + \frac{-3}{2x-1} + \frac{1}{(2x+1)(2x-1)}$$

$$\frac{2x^2 - 9x - 25}{(2x+1)(2x-1)}$$

$$\frac{4}{2x+1} + \frac{-3}{2x-1} + \frac{1}{(2x+1)(2x-1)}$$

$$\begin{aligned} \therefore \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx &= \int \frac{4}{(x+1)} dx + \int \frac{-3}{(x-2)} dx + \int \frac{1}{(x+3)} dx \\ \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} &= 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3| + C \end{aligned}$$

$$\int \frac{2x^2 - 9x + 35}{(x+1)(x-2)(x+3)} = 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3| + C$$