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MATRIC NO: 19/MHS01/179

MATHS ASSIGNMENT

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$$2. \int \frac{4x - 16}{x^2 - 2x - 3} dx$$

Soln

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

$$= \frac{A}{x+1} + \frac{B}{x-3}$$

$$A(x-3) + B(x+1) = 4x - 16$$

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

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

$$\text{Hence, } A + B = 4$$

$$-3A + B = -16$$

$$\text{Therefore, } A = 4 - B$$

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

$$-12 + 3B + B = -16$$

$$-12 + 4B = -16$$

$$4B = -16 + 12$$

$$4B = -4$$

$$\therefore B = -1$$

Substitute B to A Do same process for B

$$B = 4 - A$$

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

$$-4A = -20$$

$$\therefore A = 5$$

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

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

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

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

(i)

2020

$$1. \int \frac{11-3x}{x^2+2x-3} dx$$

Soln

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

$$= \frac{A}{x+1} + \frac{B}{x+3}$$

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

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

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

$$\text{Hence, } A + B = -3$$

$$3A - B = 11$$

$$\therefore A = -3 - B$$

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

$$-9 - 3B - B = 11$$

$$-9 - 4B = 11$$

$$-4B = 20$$

$$\therefore B = 5$$

$$\therefore B = -3 - A$$

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

$$3A + 3 + A = 11$$

$$4A + 3 = 11$$

$$4A = 8$$

$$\therefore A = 2$$

Substitute A & B into the equation

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

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

$$\therefore \int \frac{11-3x}{x^2+2x-3} dx = 2 \ln|x-1| + 5 \ln|x+3| + C$$

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

Soln

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

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

$$A(x^2 + x - 6) + B(x^2 + 4x + 3) + C(x^2 - x - 2) = 2x^2 - 9x - 35$$

$$x^2(A + B + C) + x(4B + C) - 6A + 3B - 2C = 2x^2 - 9x - 35$$

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

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

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

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

$$2 - B - C + 4B - C = -9 \quad \text{--- (5)}$$

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

Substitute eqn (4) into (3)

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

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

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

$$-2C + 8B = -11 \quad \text{--- (5) } \times 3$$

$$9B + 4C = -23 \quad \text{--- (6) } \times 1$$

$$-6C$$

$$-6C + 9B = -83$$

$$4C + 9B = -23$$

$$10C = 60$$

$$C = 6$$

Using eqn (6) to find A

$$9B + 4C = -23$$

$$9B + 4(6) = -23$$

$$9B + 24 = -23$$

$$9B = -47$$

$$B = -5.22$$

(3)

Using equation (4) to find A

$$A = 2 - B - C$$

$$A = 2 - (-3) - 1$$

$$A = 4$$

∴ A, B & C = 4, -3 & 1 respectively

Thus,

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

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

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