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DEPARTMENT: MBBS

COURSE CODE: MAT 104 A

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

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

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

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

At $x = -3$, we have

$$B(-4) = 11 - 3(-3) = 11 + 9$$

$$B = -5$$

At $x = 1$, we have

$$A(4) = 8$$

$$A = 2$$

Hence,

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

$$= 2 \ln|x-1| - 5 \ln|x+3|$$

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

$$= \frac{4x-16}{(x+1)(x-3)}$$

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

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

At $x = -1$

$$A(-1-3) = 4(-1) - 16$$

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

$$A(-4) = -20$$

$$A = 5$$

At $x = 3$

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

$$B(4) = 12 - 16$$

$$B(4) = -4$$

$$B = -1$$

Then,

$$\frac{4x-16}{(x+1)(x-3)} = \frac{5}{x+1} + \frac{(-1)}{x-3}$$

$$\frac{4x-16}{(x+1)(x-3)} = \frac{5}{x+1} - \frac{1}{x-3}$$

$$= 5 \int \frac{dx}{x+1} - \int \frac{dx}{x-3}$$

$$= 5 \ln|x+1| - \ln|x-3| + C$$

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

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

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

$$Ax^2 + Ax - 6A + Bx^2 + 4Bx + 3B + Cx^2 - Cx - 2C = 2x^2 - 9x - 35$$

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

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

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

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

from equ (i)

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

substituting (iv) into (ii)

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

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

substituting (iv) into (iii)

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

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

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

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

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

$$-6C + 9B = -33 \quad \text{(vii)}$$

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

$$-10C = -10$$

$$C = 1$$

from equ (vi): $4C + 9B = -23$

$$4(1) + 9B = -23$$

$$9B = -23 - 4$$

$$9B = -27$$

$$B = -3$$

from equ (iv): $A = 2 - B - C$

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

$$A = 2 + 3 - 1$$

$$A = 4$$

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

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

$$= 4 \ln(x+1) - 3 \ln(x-2) + \ln(x+3)$$