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 DEPT: MEDICINE AND SURGERY
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ASSIGNMENT

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

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

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

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 $x = 1$

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

$$8 = 4A$$

$$A = 2$$

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

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

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

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

$$(x-3)(x+1)$$

Multiply all by $(x-3)(x+1)$

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

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

$$x[A+B] + [A-3B] = 4x-16$$

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

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

$$4B=20 \quad \text{--- (3)}$$

$$B=5$$

But eqn (3) into (1)

$$A+5=4$$

$$A=4-5$$

$$A=-1$$

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

$$\text{Let } u = x-3 \quad \text{let } u = x+1$$

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

$$dx = du \quad dx = du$$

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

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

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

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

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

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

$$= Ax^3 + 3Ax^2 - 2Ax - 6A + Bx^2 + 3Bx + Bx + 3B + Cx^2 - 2C$$

$$(x+1)(x-2)(x+y)$$

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

$$(x+1)(x-2)(x+y)$$

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

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

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

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

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

Put eqn (4) in (2) and (3)

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

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

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

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

(3)

$$-6[2-B-C] + 3B-2C = -35$$

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

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

Solve eqn (5) and (6) simultaneously:

$$4 \times 3B-2C = -11$$

$$2 \times 9B+4C = -23$$

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

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

$$30B = -90$$

$$B = -3 \quad \text{--- (7)}$$

Put (7) in (5)

$$3(-3)-2C = -11$$

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

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

Put (6) in (4)

$$A = 2 - B - C$$

$$A = 2 - (-3) - C \quad (1)$$

$$A = 2 + 3 - 1$$

$$A = 4$$

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

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

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