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Dept MBBS

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

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

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

Divide both sides by  $(x-1)(x+3)$

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

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

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

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

$$3A - B = 11$$

To Find B

$$A = -3 - B$$

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

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

$$-4B = 20$$

$$B = -5$$

To Find A

$$B = -3 - A \implies (-5) = -3 - A$$

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

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

$$4A = 8$$

$$A = 2$$

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

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

$$\int \frac{11-3x}{(x-1)(x+3)} = 2 \ln|x-1| - 5 \ln|x+3| + C_4$$

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

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

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

$$4x - 16 = -1$$

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

$$0 + B(-4) = 4 - 16$$

$$-4B = -12$$

$$B = 3$$

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

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

$$12 - 16 = 4A + 0$$

$$-4 = 4A$$

$$A = -1$$

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

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

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

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

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

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

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

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

Hence

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

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

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

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

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

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

Substituting (iv) into (iii)

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

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

$$4C + 4B = -23 \quad (vi)$$

Using elimination Method

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

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

$$-6C + 4B = -33$$

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

$$-10C = -10$$

$$C = 1$$

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

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

$$4B = -27$$

$$B = -3$$

Using equation (iv)

$$A = 2 - B - C$$

$$A = 2 + 3 - 1$$

$$A = 4$$

$$\therefore \int \frac{2x^3 - 9x - 35}{(x+1)(x-2)(x+3)} = 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3| + C_4$$