

19/MHS01/244

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Matric no: 19/MHS01/244

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

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

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

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

Equate x to 1

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

$$11-3 = 4A + 0$$

$$\frac{8}{4} = \frac{4A}{4}$$

$$\therefore A = 2$$

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

Equate x to -3

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

$$11+9 = 0 + -4B$$

$$\frac{20}{-4} = \frac{-4B}{-4}$$

$$\therefore B = -5$$

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

$$\text{Let } u = x-1$$

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

$$du = dx$$

$$\int \frac{2 du}{u} = 2 \ln u$$

$$\text{Let } u \text{ be } (x+3)$$

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

$$du = dx$$

$$-5 \int \frac{du}{u} = -5 \ln u$$

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

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

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

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

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

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

Let x be -1 to find B

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

$$-4-16 = -4B$$

$$\frac{-20}{-4} = \frac{-4B}{-4}$$

$$\therefore B = 5$$

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

Let x be 3 to find A

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

$$12-16 = 4A$$

$$\frac{-4}{4} = \frac{4A}{4}$$

$$A = -1$$

$$A = -1, B = 5$$

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

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

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

$$du = dx$$

$$-1 \int \frac{du}{u} = -\ln u$$

$$\text{Let } v = (x+1)$$

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

$$dv = dx$$

$$5 \int \frac{dv}{v} = 5 \ln v$$

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

$$6. \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx$$

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

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

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

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

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

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

clt

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

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

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

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

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

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

Put equation (4) into equation (2)

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

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

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

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

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

Put equation (4) into equation (3)

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

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

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

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

$$9B + 4C = -35 + 12$$

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

Equate equation (5) to (6)

$$\times 1 \quad 9B + 4C = -23 \quad \times 1$$

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

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

$$6B - 4C = -22$$

$$\hline 15B = -45$$

$$\frac{15B}{15} = \frac{-45}{15}$$

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B = -3

Put B = -3 into equation (6)

9B + 4C = -23

9(-3) + 4C = -23

-27 + 4C = -23

4C = -23 + 27

4C = 4
4 4

C = 1

Recall,

A = 2 - B - C where b = -3, c = 1

A = 2 - (-3) - 1

A = 2 + 3 - 1

A = 4

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

Let u = (x+1)
dy/dx = 1
du = dx

Let u = (x-2)
dy/dx = 1
du = dx

Let u = (x+3)
dy/dx = 1
du = dx

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

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

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