

Question 2

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

Soln

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

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

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

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

We know that

$$(x+1)(x-3), x = -1 \text{ or } +3$$

Find A

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

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

$$-20 = -4A$$

$$A = 5$$

Find B

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

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

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

$$-4 = 4B$$

$$B = -1$$

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

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

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

Ans

Question 3

$$(30) \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} dx$$

Soln

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

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

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

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

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

$$-24 = A(-3)(2)$$

$$-24 = -6A$$

$$A = 4$$

$$A = 4$$

$$\text{Let } x = 2$$

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

$$8 - 18 - 35 = B(3)(5)$$

$$-45 = 15B$$

$$B = -3$$

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

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

$$18 + 27 - 35 = C(-2)(-5)$$

$$10 = C(10)$$

$$C = 1$$

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

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

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

$$= 4 \ln|x+1| + \ln|x+3| - 3 \ln|x-2| + C$$

Ans

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

So/ly

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

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

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

We know from

$$(x-1)(x+3), x=1 \text{ or } -3$$

Find A

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

$$11-3(1) = A(4) + B(1-1)$$

$$\frac{8}{4} = \frac{4A}{4} + \frac{B(0)}{4}$$

$$A = 2$$

Find B

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

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

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

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

$$B = -5$$

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

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

Consider

$$\int \frac{2dx}{(x-1)}$$

$$y = x-1$$

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

$$dx = dy$$

$$\int \frac{2dx}{(x-1)} = \int \frac{2}{y} dy$$

$$= 2 \int \frac{1}{y} \cdot dy$$

$$= 2 \ln y = 2 \ln(x-1)$$

Consider

$$\int \frac{5dx}{(x+3)} \quad y = x+3$$

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

$$dx = dy$$

$$\int \frac{5}{(x+3)} dx = \int \frac{5}{y} \cdot dy$$

$$= 5 \int \frac{1}{y} \cdot dy$$

$$= 5 \ln y = 5 \ln(x+3)$$

Therefore;

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

$$= 2 \ln(x-1) - 5 \ln(x+3) + C$$

Ans