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MATA 104

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

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

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

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

$$f(-3) \Rightarrow 11-3(-3) = -4B$$

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

$$B = -5$$

$$f(1) \Rightarrow 11-3(1) = A(1+3)$$

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

$$A = 2$$

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

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

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

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

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

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

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

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

$$f(3) \Rightarrow 4(3)-16 = B(3+1)$$

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

$$B = -1$$

$$f(-1) \Rightarrow 4(-1)-16 = A(-1-3)$$

$$-20 = -4A$$

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

$$A = 5$$

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

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

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

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

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

$$dx = du$$

$$dx = du$$

$$\int \frac{5 \cdot dy}{u}$$

$$\int \frac{-1 \cdot du}{u}$$

$$5 \ln u$$

$$= -\ln u$$

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

$$= -\ln(x-3)$$

$$\frac{4x-16}{x^2-2x-3} = 5 \ln(x+1) - \ln(x-3) + C$$

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

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

$$2x^2-9x-35$$

$$2x^2-9x-35$$

$$A+B+C$$

$$A+4B-$$

$$-6A+3$$

$$A = 2-B$$

$$\text{put } f \text{ in}$$

$$u(2) -$$

$$2+4$$

$$3$$

$$u(8) -6$$

$$-10$$

$$6$$

Sol

3

12

1

Sub

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

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

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

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

$$\therefore A + B + C = 2 \quad \dots (1)$$

$$A + 4B - C = -9 \quad \dots (2)$$

$$-6A + 3B - 2C = -35 \quad \dots (3)$$

$$A = 2 - B - C \quad \dots (4)$$

Put (4) into (2) and (3)

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

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

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

$$3B - 2C = -11 \quad \dots (5)$$

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

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

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

$$9B + 4C = -23 \quad \dots (6)$$

Solving eqs (5) and (6) by substitution

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

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

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

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

$$\frac{30B = -90}{30} \quad \frac{-90}{30}$$

$$B = -3$$

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

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

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

$$-2C = -2$$

$$\begin{aligned} -9 - 2C &= -11 \\ -2C &= -11 + 9 \\ -2C &= -2 \\ \frac{-2C}{-2} &= \frac{-2}{-2} \end{aligned}$$

$$C = 1$$

from eq 4

$$A = 2 - B - C$$

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

$$A = 2 + 3 - 1$$

$$A = 4$$

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

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

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