

ASSIGNMENT

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Medicine & Surgery

MHS

① $\int \frac{11-3x}{x^2+2x-3} dx$

solution

$$\begin{aligned} \int \frac{11-3x}{x^2+2x-3} dx &= \frac{11-3x}{(x-1)(x+3)} \\ &= \frac{A}{(x-1)} + \frac{B}{(x+3)} \\ &= \frac{A(x+3) + B(x-1)}{(x-1)(x+3)} \end{aligned}$$

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

At $x = -3$

$$B(-4) = 20$$

$$B = -5$$

At $x = 1$

$$A(4) = 8$$

$$A = 2$$

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

Let $u = x+3$

$$du = dx$$

$u = x-1$

$$du = dx$$

$$\Rightarrow \int \frac{-5 du}{u}$$

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

$$= -5 \ln u$$

$$= 2 \ln u$$

$$= 2 \ln u - 5 \ln u$$

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

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

$$6) \int \frac{4x-16}{x^2-2x-3} dx$$

Solution:

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

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

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

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

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

$$B(-4) = -20$$

$$B = 5$$

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

$$A(4) = -4$$

$$A = -1$$

$$\int \frac{-1}{x-3} dx + \int \frac{5}{x+1} dx = \int \frac{4x-16}{x^2-2x-3} dx$$

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

$$u = x+1$$

$$du = dx$$

$$du = dx$$

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

$$\int \frac{5 du}{u}$$

$$= -\ln u$$

$$= 5 \ln u$$

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

$$7) \int \frac{2x^2-9x-35}{(x+1)(x-2)(x+3)} dx$$

Solution:

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

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

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

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

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

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

$$A+B+C = 2 \quad \text{--- ①}$$

$$A+4B-C = -9 \quad \text{--- ②}$$

$$6A-3B+2C = 35 \quad \text{--- ③}$$

$$\text{②} - \text{①}: 3B - 2C = -11 \quad \text{--- ④}$$

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

$$B = \frac{2C - 11}{3}$$

Put $B = \frac{2C-11}{3}$ as B in ③

$$6A - 3\left(\frac{2C-11}{3}\right) + 2C = 35$$

$$6A - 2C + 11 + 2C = 35$$

$$6A + 11 = 35$$

$$6A = 24 \quad \therefore A = 4$$

put 4 in A in ① & ②

$$B + C = -2 \quad \text{--- ⑤}$$

$$4B - C = -13 \quad \text{--- ⑥}$$

$$\text{⑤} + \text{⑥}: 5B = -15$$

$$B = -3$$

put -3 in B in ⑤: $-3 + C = -2$

$$C = 1$$

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

$$= 4 \ln(x+1) + (-3 \ln(x-2)) + \ln(x+3)$$

$$= 4 \ln(x+1) - 3 \ln(x-2) + \ln(x+3)$$