

Maths 104 Assignment.

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Matric no: 19/mth501/092

Serial no: No 177

① $\int \frac{11-3x}{(x^2+2x-3)} dx.$

Soln.

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

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

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

when $x=1$

$$\text{then, } 11-3(1) = A(1+3) + B(1-1)$$

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

$$8 = 4A$$

$$2 = A$$

$$A = 2$$

when $x=-3$

$$\text{then, } 11+3(-3) = A(-3+3) + B(-3-1)$$

$$20 = A(0) + (-4B)$$

$$20 = -4B$$

$$-5 = B$$

$$B = -5$$

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

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

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

Soln.

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

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

when $x = -1$

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

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

$$\begin{aligned} -4A + 0 &= -20 \\ \underline{-4} & \quad \underline{-4} \end{aligned}$$

$$A = 5$$

when $x = 3$

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

$$A(0) + B(4) = 12 - 16$$

$$\begin{aligned} 4B &= -4 \\ \underline{4} & \quad \underline{4} \end{aligned}$$

$$B = -1$$

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

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

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

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

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

no

when $x = 2$.

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

$$= A(0)(5) + B(5)(3) + C(3)(0) \\ = 2(4) - 18 - 35$$

$$= 0 + 15B + 0 = -45$$

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

$$B = -3 //$$

when $x = -1$

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

$$= A(-3)(+2) + B(+2)(0) + C(0)(1) \\ = 2(1) + 9 - 35$$

$$= A - 6 + 0 + 0 = -24$$

$$\frac{-6A}{-6} = \frac{-24}{-6}$$

$$A = 4 //$$

when $x = -3$

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

$$= A(-5)(0) + B(0)(-2) + C(-2)(-5) \\ = 2(9) + 27 - 35$$

$$= 0 + 0 + 10C = 10$$

$$\frac{10C}{10} = \frac{10}{10}$$

$$C = 1$$

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

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

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