

No. 1

MATHS ASSIGNMENT

2.

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

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

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

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

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

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

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

$$Ax - A + Bx + 3B = -3x + 11$$

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

let,

$$\therefore A+B = -3 \quad \text{--- (i)}$$

$$-A+3B = 11 \quad \text{--- (ii)}$$

$$B = -A - 3 \quad \text{--- (iii)}$$

sub B into eqn (ii)

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

$$-A - 3A - 9 = 11$$

$$-4A = 11 + 9$$

$$-4A = 20$$

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

$$A = -5$$

No. 1 cont'd

$$A = -5$$

Sub A into eqn (iii)

$$B = -5 - 3$$

$$B = -8$$

Sub A and B into eqn (a)

$$A \ln|x+1| + B \ln|x+3| + C$$

$$= 5 \ln|x-1| + 8 \ln$$

$$-5 \ln|x-1| - 8 \ln|x+3| + C$$

$$= \ln|x-1|^{-5} + \ln|x+3|^{-8} + C$$

$$= \ln \left(\frac{|x-1|^{-5}}{|x+3|^{-8}} \right) + C$$

$$x(x-3) - 1(x$$

$$x^2 - 3$$

$$x(x-3) + 1(x+3)$$

$$-x - 3$$

NO. 2

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

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

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

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

$$Ax - A + Bx - 3B = 4x - 16$$

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

let,

$$A + B = 4 \quad \text{--- (i)}$$

$$-A - 3B = -16 \quad \text{--- (ii)}$$

$$B = 4 - A$$

Sub B into eqn (i)

$$A + (4 - A) = 4$$

$$-A - 3(4 - A) = 4$$

$$-A - 12 + 3A = 4$$

$$2A = 16$$

$$\frac{2A}{2} = \frac{16}{2}$$

$$A = 8$$

Sub A into eqn (ii)

$$B = 4 - 8$$

$$B = -4$$

$$= A \ln|x+1| + B \ln|x-3| + C \quad \text{--- (iii)}$$

Sub A and B into eqn (iii)

$$\text{Answer} = 8 \ln|x-1| + 4 \ln|x-3| + C$$

No. 3

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

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

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

Let $x = -1$ in eqn (i)

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

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

$$\therefore A = 4$$

Let $x = 2$ in eqn (i)

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

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

$$\therefore B = -3$$

Let $x = -3$ in eqn (i)

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

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

$$\therefore C = 1$$

Therefore

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

Hence we can write it as

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

$$\int \frac{1}{ax+b} dx = \frac{1}{a} \log |ax+b| + C$$

$$= 4 \log |x+1| - 3 \log |x-2| + \frac{1}{2} \log |x+3| + C$$

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

$$= 4 \log |x+1| - 3 \log |x-2| + \frac{1}{2} \log |x+3| + C$$