IKINWOT SAMUEL UDUAK
MBBS
19/MHS01/202

MATHS ASSIGNMENT

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1. $\dfrac{11-3x}{x^2+2x-3}$

$\Rightarrow \int \dfrac{11-3x}{x^2+2x-3}\,dx$

From the denominator,

$x^2+2x-3=0$

$x^2+3x-x-3=0$

$x(x+3)-1(x+3)=0$

$(x-1)(x+3)=0$

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

Resolving $\dfrac{11-3x}{(x-1)(x+3)}$ into partial fraction

$\dfrac{11-3x}{(x+3)(x-1)} \equiv \dfrac{A}{(x+3)} + \dfrac{B}{(x-1)}$

$\dfrac{11-3x}{(x+3)(x-1)} \equiv \dfrac{A(x-1)+B(x+3)}{(x+3)(x-1)}$

Equating the numerators

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

Put $x=1$

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

$8 = 4B$

$B = 2$

Put $x=-3$

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

$20 = -4A$

$A = -5$

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

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

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

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

~~$\Rightarrow -5\ln(x+3) + 2(\ln x$~~

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

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

From the denominator,

$x^2-2x-3=0$

$x^2-3x+x-3=0$

$x(x-3)+1(x-3)=0$

$(x-3)(x+1)=0$

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

Resolving $\dfrac{4x-16}{(x-3)(x+1)}$ into partial fraction

$\dfrac{4x-16}{(x-3)(x+1)} \equiv \dfrac{A}{(x-3)} + \dfrac{B}{(x+1)}$

$\dfrac{4x-16}{(x-3)(x+1)} \equiv \dfrac{A(x+1)+B(x-3)}{(x+1)(x-3)}$

Equating the numerators

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

Put $x=3$

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

$-4 = 4A$

$A = -1$

Put $x=-1$

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

$-20 = -4B$

$B = 5$

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

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

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

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

$$\Rightarrow -1 \ln(x-3) + 5 \ln(x+1).$$

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

Resolving into partial fraction

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

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

Equating the numerators

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

Put $x = 2$

$-45 = 15B$

$B = -3.$

Put $x = -1$

$-24 = -6A$

$A = 4$

Put $x = -3$

$10 = 10C$

$C = 1$

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

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

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

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

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