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MATRIC NO: 19/MHS01/053
COURSE CODE: MAT 104

Assignment

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

factorise x^2+2x-3

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

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

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

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

when $f(-3)$

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

$20 = 0 + -4B$

$20 = -4B$

$B = \frac{\cancel{20}\,5}{\cancel{-4}\,1}$

$B = -5$ //

$$\int \frac{5}{(x+1)}\,dx = \int \frac{5}{u}\,du$$

$$= 5\int \frac{1}{u}\,du$$

$$= 5\,\text{In}\,u + C_{\,//}$$

$$= -1\,\text{In}\,u + c + 5\,\text{In}\,u + C$$

$$= -1\,\text{In}\,(x-3) + c + 5\,\text{In}\,(x+1) + c$$

$$= -1\,\text{In}\,(x-3) + 5\,\text{In}\,(x+1) + C_{\,//}$$

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

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

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

$\therefore \int \frac{1}{u} du$

$\ln u + c$

$\ln (x+3) + c$

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

$+ c$

when $x = -3$

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

$10 = 10C$

$C = \frac{10}{10} = 1$

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

For $\int \frac{4}{(x+1)}\,dx$

$u = x+1, \quad \frac{du}{dx} = 1, \quad du = dx$

$4\int \frac{1}{u}\,du = 4 \ln u + c$
$= 4 \ln(x+1) + c$

For $\int \frac{-3}{(x-2)}\,dx$

$u = x-2, \quad \frac{du}{dx} = 1, \quad du = dx$

$-3\int \frac{1}{u}\,du = -3 \ln u + c$
$= -3 \ln(x-2) + c$

For $\int \frac{1}{(x+3)}\,dx$

$u = x+3, \quad \frac{du}{dx} = 1, \quad du = dx$

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

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

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

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

When $x=2$

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

$$-45 = 15B$$

$$B = \frac{-45}{15} = -3$$

When $x=-1$

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

$$-24 = -6A$$

$$A = \frac{+24}{+6} = 4$$

when $f(-1)$

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

$$-4 - 16 = 0 - 4B$$

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

$$B = 5$$

Substitute for value $A = \cancel{5}\ -1$ and $B = 5$

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

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

For $\int \frac{-1}{(x-3)}\,dx$

Let $u = x - 3$, $\frac{du}{dx} = 1$, $du = dx$

$$\int \frac{-1}{(x-3)}\,dx = \int \frac{-1}{u}\,du$$

$$= -1 \int \frac{1}{u}\,du$$

$$= -1 \ln u + C$$

For $\int \frac{5}{(x+1)}\,dx$

Let $u = x + 1$, $\frac{du}{dx} = 1$, $dx = du$

$$\int \frac{-5}{(x+3)}\,dx = \int \frac{-5}{u}\,du$$

$$= -5\int \frac{1}{u}\,du$$

$$= -5\,\text{In}\,u + C$$

$$\therefore = 2\,\text{In}\,u + C + (-5\,\text{In}\,u + C)$$

$$= 2\,\text{In}\,u + C - 5\,\text{In}\,u + C$$

$$= 2\,\text{In}\,(x-1) + C - 5\,\text{In}\,(x+3) + C$$

$$= 2\,\text{In}\,(x-1) - 5\,\text{In}\,(x+3) + C$$

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

factorise $x^2 - 2x - 3$

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

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

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

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

when $f(3)$

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

$$12 - 16 = 4A + 0$$

$$-4 = 4A$$

$$A = \frac{-\cancel{4}}{\cancel{4}} \quad A = -1$$

when f(+1)

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

$$8 = 4A + 0$$

$$\frac{4A}{\cancel{4}} = \frac{\cancel{8}^{2}}{\cancel{4}_{1}}$$

$$A = 2$$

Substitute for value $A = 2$ and $B = -5$

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

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

For $\int \frac{2}{(x-1)} dx$

Let $u = x - 1$, $\frac{du}{dx} = 1$, $dx = du$

$$\int \frac{2}{(x-1)} dx = \int \frac{2}{u} \cdot du$$

$$= 2 \int \frac{1}{u} du$$

$$= 2 \ln u + C$$

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

Let $u = x + 3$, $\frac{du}{dx} = 1$, $dx = du$