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DEPARTMENT: M.B.B.S

MATRIC NO: 19/MHS01/277

COURSE: MAT 104

### ASSIGNMENT

(P)  $\frac{11-3x}{x^2+2x-3} dx$

Solution

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

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

at  $x=1$ , we have

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

$$8 = 4B$$

$$B = 2$$

At  $x=-3$ , we have

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

$$11+9 = -4A$$

$$20 = -4A$$

$$A = -5$$

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

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

when  $u = x + 3$

$$u = dx$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$\therefore \int \frac{-5}{u} du = -5 \ln u$$

when  $u = x - 1$

$$du = dx$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

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

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

$$\textcircled{2} \int \frac{4x+6}{x^2-2x-3} dx$$

$$\frac{4x+6}{x^2-2x-3} = \frac{A}{(x-3)} + \frac{B}{(x+1)} = \frac{4x+6}{(x-3)(x+1)}$$

$$4x+6 = A(x+1) + B(x-3)$$

At  $x = -1$ , we have

$$4(-1) + 6 = B(-1-3)$$

$$-4 + 6 = -4B$$

$$-2 = -4B$$

$$B = \frac{1}{2}$$

At  $x = 3$ , we have

$$4(3) + 6 = A(3+1)$$

$$12 + 6 = 4A$$

$$18 = 4A$$

$$A = \frac{18}{4} = \frac{9}{2}$$

$$\frac{4x+6}{x^2-2x-3} = \int \frac{9/2}{(x-3)} dx + \int \frac{1/2}{(x+1)} dx$$

when  $u = x - 3$

$$du = dx$$

$$\int \frac{9/2}{(x-3)} dx = \int \frac{9/2}{u} du = \frac{9}{2} \ln u$$

when  $u = x + 1$

$$du = dx$$

$$\int \frac{1/2}{(x+1)} = \int \frac{1/2}{u} du = \frac{1}{2} \ln u$$

$$\therefore \frac{4x+6}{x^2-2x-3} = \frac{9}{2} \ln u + \frac{1}{2} \ln u$$

$$\therefore \frac{4x+6}{x^2-2x-3} = \frac{9}{2} \ln (x-3) + \frac{1}{2} \ln (x+1)$$

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

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

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

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

When  $x = -1$ ,

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

$$2 + 9 - 35 = A(-3)(2)$$

$$-24 = -6A$$

$$A = 4$$

When  $x = 2$ ,

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

$$8 - 18 - 35 = B(3)(5)$$

$$-45 = 15B$$

$$B = -3$$

When  $x = -3$ ,

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

$$2(9) + 27 - 35 = C(-2)(-5)$$

$$18 + 27 - 35 = 10C$$

$$10 = 10C$$

$$r = 1$$

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

$$\text{when } u = x+1$$

$$du = dx$$

$$\int \frac{4}{x+1} dx = \int \frac{4}{u} du = 4 \ln u$$

$$\text{when } u = x-2$$

$$du = dx$$

$$\int \frac{-3}{x-2} dx = \int \frac{-3}{u} du = 3 \ln u$$

$$\text{when } u = x+3$$

$$du = dx$$

$$\int \frac{1}{x+3} dx = \int \frac{1}{u} du = \ln u$$

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

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