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MATHS NUMBER: 191MHS01245
COURSE CODE: MATHS 104
ASSIGNMENT

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

SOLUTION

$$x^2+2x-3 = x(x+3)-1(x+3)$$

$$x^2+2x-3 = (x-1)(x+3)$$

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

multiply b.o by $(x-1)(x+3)$

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

$$\text{At } x = -3$$

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

$$B(-3-1) = 11+9$$

$$-4B = 20$$

$$B = -5$$

$$\text{At } x = +1$$

$$4A = 11-3$$

$$4A = 8$$

$$A = 2$$

we can now write that

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

$$\text{let } u = x-1$$

$$u = x+3$$

$$du = dx$$

$$du = dx$$

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

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

$$= 2 \ln u$$

$$= -5 \ln u$$

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

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

solution

$$\frac{x^2-2x}{x^2-2x} = \frac{x^2-1x+1x-2x}{x(x-1)(x-2)}$$

$$\frac{x^2-2x}{x^2-2x} = \frac{x^2-2x}{x^2-2x}$$

$$x^2-2x = x(x-2)$$

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

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

multiply both sides by $x(x-2)$

$$4x-16 = A(x-2) + B(x)$$

$$\text{At } x=2$$

$$4(2)-16 = A(2-2) + B(2)$$

$$-8 = 2B$$

$$B = -4$$

$$\text{At } x=0$$

$$4(0)-16 = A(0-2) + B(0)$$

$$-16 = -2A$$

$$A = 8$$

$$\therefore \int \frac{4x-16}{x^2-2x} = \int \frac{8}{x} + \int \frac{-4}{x-2}$$

$$= 8 \ln x$$

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

$$du = dx$$

$$= -4 \ln u$$

$$= -4 \ln(x-2)$$

$$\int \frac{4x-16}{x^2-2x} = 8 \ln x - 4 \ln(x-2)$$

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

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

multiply both sides by $(x+1)(x-2)(x+3)$

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

$$\text{At } x = +2$$

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

$$0 + 15B + 0 = 2(2)^2 - 9(2) - 35$$

$$15B = -45$$

$$B = -3 \dots \text{Eqn 1}$$

$$\text{At } x = -1$$

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

$$-6A + 0 + 0 = 2 + 9 - 35$$

$$-6A = -24$$

$$A = 4 \dots \text{Eqn 2}$$

$$\text{At } x = -3$$

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

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

$$C = 1 \dots \text{Eqn 3}$$

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

$$\text{let } u = (x+1)$$

$$u = x-2$$

$$u = x+3$$

$$dx = du$$

$$dx = du$$

$$dx = du$$

$$= 4 \int \frac{du}{u}$$

$$-3 \int \frac{du}{u}$$

$$+ \int \frac{du}{u}$$

$$= 4 \ln u$$

$$-3 \ln u$$

$$+ \ln u$$

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