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Department: Medicine and Surgery

Matric number: 19/MHS01/369

Course: MAT104

Assignment

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

Solution

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

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

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

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

$$f(3) \Rightarrow 11-3(3) = A(3+3) + B(3-1)$$

$$11+9 = -4B$$

$$20 = -4B$$

$$B = -5$$

$$f(1) \Rightarrow 11-3(1) = A(1+3) + B(1-1)$$

$$8 = 4A$$

$$A = 2$$

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

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

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

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

$$\int \frac{2}{x-1} dx$$

Let $u = x-1$

$$du = dx$$

$$dx = du$$

$$dx = du$$

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

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

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

$$du = 1$$

$$dx$$

$$dx = du$$

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

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

$$= 2 \ln u$$

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

$$\int \frac{5 dx}{x+3}$$

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

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

$$\int \frac{5 dx}{x+3} = \int \frac{5 \cdot du}{u}$$

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

$$= 5 \ln u$$

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

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

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

solution

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

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

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

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

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

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

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

$$dx = du$$

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

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

$$\int \frac{5 dx}{x+3}$$

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

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

$$\int \frac{5 dx}{x+3} = \int \frac{5 du}{u}$$
$$= 5 \int \frac{1 du}{u}$$

$$= 5 \ln u$$

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

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

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

Solution

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

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

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

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

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

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

$$-4 = 4A$$

$$A = -1$$

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

$$-12 = -4B$$

$$B = 3$$

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

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

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

$$\int \frac{4x-16}{x^2-2x-3} dx = \int \frac{3}{x+1} dx - \int \frac{1}{x-3} dx$$

$$\int \frac{3}{x+1} dx$$

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

$$du = 1$$

$$dx$$

$$dx = du$$

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

$$= 3 \int \frac{1}{u} du$$

$$= 3 \ln u$$

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

$$\int \frac{1}{x-3} dx$$

$$\text{Let } u = x-3$$

$$du = 1$$

$$dx$$

$$dx = du$$

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

$$= \ln u$$

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

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

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

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

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

$$2x^2-9x-35 =$$

$$f(x) \Rightarrow$$

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

$$-24 =$$

$$A =$$

$$f(x) \Rightarrow$$

$$2(2)^2-9(2)-35 = A$$

$$-45 =$$

$$B =$$

$$f(x) \Rightarrow$$

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

$$10 =$$

$$C =$$

$$2x^2-9x-35 =$$

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

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

$$\int \frac{A}{x+1} dx$$

$$\int \frac{B}{x-2} dx$$

$$\int \frac{C}{x+3} dx$$

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

$$du = 1, dx = du$$

$$dx$$

$$= \ln u$$

$$\int_{x-3}^1 dx = \ln(x-3)$$

$$\int \frac{4x-16}{x^2-2x-3} dx = 5 \ln|x+1| - \ln|x-3| + C$$

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

Solution

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

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

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

$$f(1) \Rightarrow$$

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

$$-24 = -6A$$

$$A = 4$$

$$f(2) \Rightarrow$$

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

$$-45 = 15B$$

$$B = -3$$

$$f(-3) \Rightarrow$$

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

$$10 = 10C$$

$$C = 1$$

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

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

$$\int \frac{4}{x+1} dx$$

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

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

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

$$= 4 \int \frac{1}{u} du$$

$$= 4 \ln u$$

$$\int \frac{4 dx}{x+1} = 4 \ln(x+1)$$

$$\int \frac{3 dx}{x-2}$$

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

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

$$dx = du$$

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

$$= 3 \int \frac{1}{u} du$$

$$= 3 \ln u$$

$$\int \frac{3 dx}{x-2} = 3 \ln(x-2)$$

$$\int \frac{1 dx}{x+3}$$

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

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

$$dx = du$$

$$dx = du$$

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

$$= \ln u$$

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

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