

MAT 104 ASSIGNMENT

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①

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

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

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

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

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

$$8 = 4A$$

$$A = 2$$

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

$$20 = -4B$$

$$B = -5$$

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

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

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



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

where K is the constant of integration

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

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

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

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

$$-4 = 4B$$

$$B = -1$$

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

$$-20 = -4A$$

$$A = 5$$

$$\frac{4x-16}{x^2-2x-3} = \frac{5}{x+1} + \frac{-1}{x-3} = \frac{5}{x+1} - \frac{1}{x-3}$$

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

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

$$\int \frac{4x-16}{x^2-2x-3} = 5 \ln(x+1) - \ln(x-3) + K$$

where K is the constant of integration



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

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

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

Comparing

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

At $x = -1$

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

$$-24 = A(-3)(2) + B(0)(2) + C(0)(-3)$$

$$-24 = -6A$$

$$A = 4$$

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

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

$$-45 = A(0)(5) + B(3)(5) + C(3)(0)$$

$$-45 = 15B$$

$$B = -3$$

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

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

$$18 + 27 - 35 = A(-5)(0) + B(-2)(0) + C(-2)(-5)$$

$$10 = 10C$$

$$C = 1$$

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

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

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

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

where K is the constant of integration -