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MATRIC NO: 19/MHS01/405
COURSE CODE: MAT 104

**1.** $\int \dfrac{11-3x}{x^2+2x-3}\,dx$

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

$$\dfrac{A}{x-1} + \dfrac{B}{x+3}$$

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

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

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

$8 = 4A$

$A = 2$

At $x = -3; f(-3) = 11-3(-3)$

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

$20 = -4B \quad ; \quad B = -5$

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

$$\int \dfrac{11-3x}{x^2+2x-3}\,dx = \int \dfrac{2}{x-1}\,dx$$

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

$$-5\int \dfrac{dx}{x-3}$$

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

$(x+3) + k$

Where k is the Constant of the

Integration.

**2.** $\int \dfrac{4x-16}{x^2-2x-3}$

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

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

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

$-4 = 4B$

$B = -1$

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

$-20 = -4A$

$A = 5$

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

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

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

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

Where k is the constant of integration.

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

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

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

Comparing;

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

$+ C(x+1)(x-2)$

At $x=-1;$

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

$(-1+3) + C(-1+1)(-1-2)$

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

$$-24 = -6A$$
$$A = 4$$

At $x = 2$;

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

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

$$-45 = 15B$$

$$B = 4 - 3$$

At $x = -3$;

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

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

$$10 = 10C$$

$$C = 1$$

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

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

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

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

Where $k$ is the constant of integration.