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DEPARTMENT: MECHATRONICS.

MATRIC NO. 19/ENG05/001.

Assignment

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

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

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

when $x+3=0$ $x=-3$.

$11-3(-3) = A(0) + B(-3-1)$

$11+9 = B(-4)$

$20 = -4B$.

$B = \frac{20}{-4}$

$B = -5$.

when $x=1=0$ $x=1$.

$11-3(1) = A(1+3) + B(0)$.

$11-3 = 4A$

$8 = 4A$

$A = \frac{8}{4}$

$A = 2$.

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

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

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

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

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

when $x+1=0$ $x=-1$

$2(-1)^2 - 9(-1) - 35 = A(-1+3)(-1-2) + B(0)(x+3) + C(0)(x-2)$

$-24 = -6A$

$A = \frac{-24}{-6}$

$A = 4$

when $x - 2 = 0$ $x = 2$.

$2(2)^2 - 9(2) - 35 = A(x+3)(0) + B(2+1)(2+3) + C(x-1)(0)$

$-45 = 15B$

$B = \frac{-45}{15}$

$B = -3$.

when $x + 3 = 0$ $x = -3$

$2(-3)^2 - 9(-3) - 35 = A(0)(x-2) + B(x+1)(0) + C(-3+1)(-1)$

$10 = 10C$.

$C = 1$

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

$$\int \frac{4}{x+1} - \frac{3}{x-2} + \frac{1}{x+3}\,dx = 4\ln(x+1) - 3\ln(x-2) + \ln(x+3). + C$$

3. $\int \frac{1}{x^2+121}\,dx = \int \frac{1}{x^2+11^2}\,dx$

$x = 11\tan\theta$

$\frac{dx}{d\theta} = 11\sec^2\theta \qquad dx = 11\sec^2\theta\, d\theta$

$\int \frac{11\sec^2\theta\, d\theta}{(11)^2\tan^2\theta + 11^2}$

$\int \frac{11\sec^2\theta\, d\theta}{11^2(1+\tan^2\theta)}$

$\int \frac{1}{11}\, d\theta$