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 MATRIC NO: 19/ENG 02/036

01)

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

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

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

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

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

at $x = 3$

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

$$11 - 9 = 4B$$

$$2 = 4B$$

$$4 = 4$$

$$B = \frac{1}{2}$$

at $x = -1$

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

$$11 + 3 = -4A$$

$$14 = -4A$$

$$A = -\frac{7}{2}$$

We write now as

$$= \int \frac{-7/2}{(x+1)} dx + \int \frac{1/2}{(x-3)} dx$$

$$= \int \frac{-7}{2(x+1)} dx + \int \frac{1}{2(x-3)} dx$$

$$11 - 9 = 4B$$

$$2 = 4B$$

$$B = \frac{1}{2}$$

at $x = -1$

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

$$11 + 3 = -4A$$

$$14 = -4A$$

$$A = -\frac{7}{2}$$

We write now as

$$= \int \frac{-\frac{7}{2}}{C(x+1)} dx + \int \frac{\frac{1}{2}}{C(x-3)} dx$$

$$= \int \frac{-7}{2C(x+1)} dx + \int \frac{1}{2C(x-3)} dx$$

$$\int \frac{-7}{2x+2} + \frac{1}{2x-6} dx$$

$$-7/2 \ln u + 1/2 \ln u$$

$$1/2 \ln(x-3) - 7/2 \ln(x+1) + C$$

Q2) $\int \frac{2x^2 + 9x - 35}{(x+1)(x-2)(x+3)} dx$

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

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

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

$$2x^2 + 9x - 35 = A(x^2 + x - 6) + B(x^2 + 4x + 3) + C(x^2 - x - 2)$$

$$2x^2 + 9x - 35 = Ax^2 + Ax - 6A + Bx^2 + 4Bx + 3B + Cx^2 - Cx - 2C$$

$$2x^2 + 9x - 35 = Ax^2 + Bx^2 + Cx^2 + Ax + 4Bx - Cx - 6A + 3B - 2C$$

$$A + B + C = 2 \dots \textcircled{1}$$

$$A + 4B - C = 9 \dots \textcircled{2}$$

$$-6A + 3B - 2C = -35 \dots \textcircled{3}$$

from equ (1) $A = 2 - B - C$

Substitute in (2) and (3)

$$C(2 - B - C) + 4B - C = 9$$

$$2 - B - C + 4B - C = 9$$

$$3B - 2C = 7 \dots \textcircled{4}$$

$$-6(2 - B - C) + 3B - 2C = -35 \dots \textcircled{5}$$

$$-12 + 6B + 6C + 3B - 2C = -35$$

$$A + B + C = 2 \dots \textcircled{1}$$

$$A + 4B - C = 9 \dots \textcircled{2}$$

$$-6A + 3B - 2C = -35 \dots \textcircled{3}$$

from equ $\textcircled{1}$ $A = 2 - B - C$

Substitute in $\textcircled{2}$ and $\textcircled{3}$

$$(2 - B - C) + 4B - C = 9$$

$$2 - B - C + 4B - C = 9$$

$$3B - 2C = 7 \dots \textcircled{4}$$

$$-6(2 - B - C) + 3B - 2C = -35 \dots \textcircled{5}$$

$$-12 + 6B + 6C + 3B - 2C = -35$$

$$-3B + 8C = -23 \dots$$

$$3B - 2C = 7 \text{ (x } -1 \text{)}$$

$$-3B - 8C = -23$$

$$-3B + 2C = -7$$

$$-3B - 8C = -23$$

$$9B - 4C = -35 + 12$$

$$9B - 4C = -23 \dots (6)$$

$$= 3B - 2C = 7$$

$$9B - 4C = -23$$

$$\} (3B - 2C) = 7 (3)$$

$$\} (9B - 4C) = -23$$

$$9B - 2C = 21$$

$$9B - 4C = -23$$

$$2C/2 = 44/2$$

$$C = 22$$

Sub e in eqn (1) & eqn (ii)

$$(2 - B - 22) + 4B - 22 = 9$$

$$2 + 3B - 44 = 9$$

$$3B = 44 + 9 - 2$$

$$3B = 44 + 7$$

$$3B/3 = 51/3$$

$$B = 17$$

Sub B and C in $A = 2 - B - C$

$$(2 - 17 - 22) = A$$

$$A = -37$$

$$C = 22$$

Sub C in eqn (I) & eqn (II)

$$(2 - B - 22) + 4B - 22 = 9$$

$$2 + 3B - 44 = 9$$

$$3B = 44 + 9 - 2$$

$$3B = 44 + 7$$

$$3B/3 = 51/3$$

$$B = 17$$

Sub B and C in $A = 2 - B - C$

$$(2 - 17 - 22) = A$$

$$A = -37$$

$$\int \frac{-37}{(x+1)} dx + \frac{17}{(x-2)} dx + \frac{22}{(x+3)} dx$$

$$-37 \left| \ln(x+1) \right| + 17 \left| \ln(x-2) \right| + 22 \left| \ln(x+3) \right| + C$$

$$-37 \ln(x+1) + 17 \ln(x-2) + 22 (\ln x + 3) + C //$$

$$03) \int \frac{1}{(x^2 + 12)} dx \quad \int \frac{1}{x^2 + 11^2} dx$$

$$x = 11 \tan \theta$$

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

$$\begin{aligned} dx &= 11 \sec^2 \theta d\theta \\ x^2 + 11^2 &= 11^2 \tan^2 \theta + 11^2 \\ &= 11^2 (\tan^2 \theta + 1) \\ &= 11^2 \sec^2 \theta \end{aligned}$$

$$\Rightarrow \int \frac{11 \sec^2 \theta d\theta}{11^2 \sec^2 \theta} = \int \frac{d\theta}{11}$$

$$\frac{1}{\parallel} \int d\theta = \frac{1}{\parallel} [\theta] + C$$

$$= \frac{1}{\parallel} \tan^{-1} x_{\parallel} + C_{\parallel} \quad \text{or} \quad \frac{1}{\parallel} \left[\frac{\tan^{-1} x}{\parallel} \right] + C_{\parallel}$$