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MECHATRONIC ENGINEERING

19/ENG 05/052

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

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

$$\text{let } x = -3$$

$$A(-4) = 11 + 9$$

$$-4A = 20$$

$$A = -5$$

$$\text{let } x = 1$$

$$B(4) = 11 - 3$$

$$4B = 8$$

$$B = 2$$

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

$$u = x+3$$

$$u = x-1$$

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

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

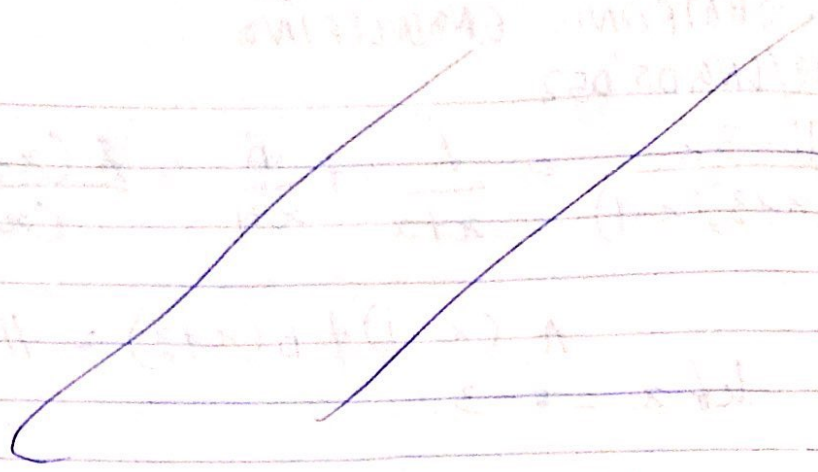
$$du = dx$$

$$du = dx$$

$$\int \frac{-5 du}{u} + \int \frac{2 du}{u}$$

$$-5 \ln u + 2 \ln u$$

$$-5 \ln(x+3) + 2 \ln(x-1)$$



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

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

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

$$x = -1$$

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

$$-24 = -6A$$

$$A = 4$$

$$\text{when } x = 2$$

$$2x^2 - 9x$$

$$8 - 18 - 35 = B(3)(5)$$

$$-45 = 15B$$

$$B = -3$$

$$\text{when } x = 3$$

$$18 - 27 - 35 = C(4)(2)$$

$$-44 = 8C$$

$$C = -\frac{11}{2}$$

$$\int \frac{4 dx}{x+1} - \int \frac{3 dx}{x-2} + \frac{1}{2} \int \frac{11 dx}{x(x+3)} = \int \frac{2x^2 - 9x - 35 dx}{(x+1)(x-2)(x+3)}$$

$$\text{let } u = x+1 \quad u = x-2 \quad u = x+3$$

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

$$du = dx \quad du = dx \quad du = dx$$

$$\int \frac{4 du}{u} - \int \frac{3 du}{u} - \frac{1}{2} \int \frac{11 du}{u}$$

$$4 \ln u - 3 \ln u - \frac{11}{2} \ln u$$

$$4 \ln(x+1) - 3 \ln(x-2) - \frac{11}{2} \ln(x+3)$$

③ ~~$\int \frac{1}{x^2+121} = \int \frac{1}{(x-11)(x+11)}$~~

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$$\int \frac{dx}{x^2+121}$$

let $x = 11 \tan \theta$

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

$$dx = 11 \sec^2 \theta d\theta$$

$$x^2 + 11^2 = 11^2 + 11^2 \tan^2 \theta$$

$$= 11^2 (\tan^2 \theta + 1)$$

$$= 11^2 \sec^2 \theta$$

$$\int \frac{dx \cdot \cancel{11} \sec^2 \theta}{\cancel{11}^2 \sec^2 \theta} d\theta$$

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

$$\frac{1}{11} (\theta)$$

$$\frac{1}{11} \tan^{-1} \frac{x}{11} + C$$