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Maths Assignment answer

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

Solve for

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

Multiply through by $(x-1)(x+3)$

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

When $x=1$

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

$$8 = 4A$$

$$A = 2$$

When $x=3$

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

$$11-9 = -4B$$

$$20 = -4B$$

$$B = -5$$

$$\therefore A = 2, B = -5$$

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

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

When $u=x-1$ and $u=x+3$

$$du = dx$$

$$du = dx$$

$$= 2 \int \frac{1}{u} du + -3 \int \frac{1}{u} du$$

$$= 2 \ln|u| + (-5) \ln|u| + c$$

$$= 2 \ln|x-1| - 5 \ln|x+3| + c$$

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

Solve for

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

Multiply through by $(x+1)(x-2)(x-3)$

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

When $x = -1$

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

$$-48 = 6B$$

$$B = -8$$

When $x = 2$

$$2(2)^2 - 9(2) - 35 = A(-1)(-1)$$

$$-24 = -A$$

$$A = 24$$

When $x = 3$

$$2(3)^2 - 9(3) - 35 = C(-3)(-2)$$

$$-16 = 6C$$

$$C = -\frac{8}{3}$$

$$\therefore A = 24, B = -8, C = -\frac{8}{3}$$

$$\int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x-3)} dx = \int \frac{24}{x-1} - \frac{8}{x-2} - \frac{8}{3(x-3)} dx$$

When $u = x+1$, $u = x-2$, $u = x-3$

$$du = dx$$

$$= 24 \int \frac{1}{u} du - 8 \int \frac{1}{v} dv - \frac{8}{3} \int \frac{1}{w} dw$$

$$= 24 \ln|u| - 8 \ln|v| - \frac{8}{3} \ln|w| + C$$

$$\int_{2c-3}^{4c-16} \frac{dx}{(c+t)(3c-3)}$$

Source for $\frac{A}{c+t} + \frac{B}{3c-3}$

Multiply through $(c+t)(3c-3)$

$$4c-16 = A(3c-3) + B(c+t)$$

$$12-16 = 4A+B$$

$$-4 = 4A+B$$

$$B = -4 - 4A$$

When $c = -1$

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

$$-20 = -4A$$

$$A = 5$$

$$B = -24$$

$$\therefore \int_{2c-3}^{4c-16} \frac{dx}{(c+t)(3c-3)} = \int_{2c-3}^{4c-16} \frac{5}{c+t} + \frac{-24}{3c-3} dx$$

$$= 5 \int_{2c-3}^{4c-16} \frac{dx}{c+t} - \int_{2c-3}^{4c-16} \frac{dx}{c-1}$$

$$= 5 \ln|c+t| - \ln|c-3| + C_1$$