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

$$x^2+2x-3$$

$$x^2+3x-x-3$$

$$x(x+3)-1(x+3)$$

$$(x-1)(x+3)$$

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

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

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

$$Ax + 3A + Bx - B = 11 - 3x$$

when  $x-1 \therefore x=1$

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

$$4A = 8$$

$$A = \frac{8}{4} \therefore A = 2$$

when  $x+3 \therefore x=-3$

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

$$-4B = 20$$

$$B = \frac{20}{-4} = -5$$

$\therefore$

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

$$u = x-1$$

$$du = 1$$

$$du = dx$$

$$u = x+3$$

$$du = 1$$

$$du = dx$$

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

$$\therefore 2 \ln u - 5 \ln u$$

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

$$2 \int \frac{4x-16}{x^2-2x-3} dx$$

$$x^2-2x-3$$

$$x^2-3x+x-3$$

$$x(x-3)+1(x-3)$$

$$(x+1)(x-3)$$

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

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

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

$$\text{when } (x+1): \therefore x = -1$$

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

$$-4A + 0 = -20$$

$$A = 5$$

$$\text{when } (x-3): \therefore x = 3$$

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

$$4B = -4$$

$$B = -1$$

$$\therefore \frac{5}{x+1} - \frac{1}{x-3}$$

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

$$u = x+1$$

$$du = 1$$

$$du = dx$$

$$u = x-3$$

$$du = 1$$

$$du = dx$$

$$= \int \frac{5}{u} x du - \int \frac{1}{u} x du$$

$$= 5 \int \frac{1}{u} x du - 1 \int \frac{1}{u} x du$$

$$= 5 \ln u - \ln u$$

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

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

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

To get A:  $(x+1) = x = -1$

Sub for  $x$  in main equation without  $(x+1)$

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

$$A = \frac{-24}{-6} \therefore A = 4$$

To get B:  $(x-2) = x = 2$

Sub for  $x$  in main equation without  $(x-2)$

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

$$B = \frac{-45}{15} \therefore B = -3$$

To get C:  $(x+3) = x = -3$

Sub for  $x$  in main equation without  $(x+3)$

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

$$C = \frac{10}{10} \quad C = 1$$

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

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

$$u = x+1$$

$$du = 1$$

$$du = dx$$

$$u = x-2$$

$$du = 1$$

$$du = dx$$

$$u = x+3$$

$$du = 1$$

$$du = dx$$

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

$$4 \ln u - 3 \ln u + \ln u$$

$$4 \ln(x+1) - 3 \ln(x-2) + \ln(x+3)$$