Equating the numerators

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

Put $x = 2$

$-45 = 15B$

$B = -3$

Put $x = -1$

$10 = 10C$

$C = 1$

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

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

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

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

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

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1) $\frac{11-3x}{x^2+2x-3}$

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

From the denominator,

$x^2+2x-3=0$

$x^2+3x-x-3=0$

$x(x+3)-1(x+3)=0$

$(x-1)(x+3)=0$

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

Resolving $\frac{11-3x}{(x-1)(x+3)}$ into partial fraction

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

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

Equating the numerators

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

Put $x=1$

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

$8 = 4B$

$B=2$

Put $x=-3$

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

$20 = -4A$

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

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

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

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

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

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

From the denominator