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

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

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

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

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

$$A+B = -3 \times 3 \dots \textcircled{1}$$

$$3A-B = 11 \times 1 \dots \textcircled{2}$$

$$3A+3B = -9$$

$$-3A-B = 11$$

$$4B = -20$$

$$B = -5$$

\therefore substitute $B = -5$ in eqn 1

$$A+B = -3$$

$$A-5 = -3$$

$$A = 2$$

$$\begin{aligned} \therefore \int \frac{11-3x}{x^2+2x-3} &= \int \frac{2}{(x-1)} - \int \frac{5}{(x+3)} \\ &= 2 \int \frac{1}{(x-1)} - 5 \int \frac{1}{(x+3)} \\ &= 2 \ln(x-1) - 5 \ln(x+3) \end{aligned}$$

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

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

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

$$4x-16 = Ax - 3A + Bx + B$$

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

$$A+B = 4 \quad x = -3 \quad \dots \textcircled{1}$$

$$B-3A = -16 \quad x = 1 \quad \dots \textcircled{2}$$

$$-3A - 3B = -12$$

$$-3A + B = -16$$

$$\underline{-4B = 4}$$

$\therefore B = -1$ (substitute in eqn i)

$$A - 1 = 4$$

$$A = 5$$

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

3 ~~$\int \frac{4x-16}{x}$~~

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

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

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

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

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

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

by comparing coefficients.

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

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

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

from eqn $\textcircled{1}$, $A = 2 - B - C \dots \textcircled{4}$

\therefore substitute eqn 2 & 3

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

$$-6(2 - B - C) + 3B - 2C = -35$$

$$3B - 2C = -11 \times 9$$

$$9B + 4C = -23 \times 3$$

$$-27B - 18C = -99$$

$$-27B + 12C = -69$$

$$\hline -30C = -30$$

$$C = 1$$

$$3B - 2C = -11$$

$$3B - 2 = -11$$

$$B = -\frac{3}{3}$$

$$A + B + C = 2$$

$$A - 3 + 1 = 2$$

$$A - 2 = 2$$

$$A = 4$$

$$\begin{aligned} \hat{=} \int \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} &= \int \frac{4}{x+1} - \int \frac{3}{x-2} + \int \frac{1}{x+3} \\ &= \underline{4 \ln(x+1) - 3 \ln(x-2) + \ln(x+3)} \end{aligned}$$