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

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

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

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

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

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

$$8 = 4B$$

$$B = 2$$

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

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

$$20 = -4A$$

$$A = -5$$

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

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

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

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

$$\Rightarrow -5 \ln|x+3| + 2 \ln|x-1|$$

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

From the denominator

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

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

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

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

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

Resolving  $\frac{4x-16}{(x+1)(x-3)}$  into partial fraction

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

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

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

Equating the numerators

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

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

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

$$-4 = 4B$$

$$B = -1$$

Put  $x = -1$

Ans 4.

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

$$-20 = -4A$$

$$A = 5$$

$$\therefore \frac{4x-16}{(x+1)(x-3)} = \frac{5}{(x+1)} - \frac{1}{(x-3)}$$

$$\int \frac{4x-16}{(x+1)(x-3)} dx = \int \left( \frac{5}{(x+1)} - \frac{1}{(x-3)} \right) dx$$

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

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

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

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

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

Resolving into partial fractions

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

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

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

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

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

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

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

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

$$C = 1$$

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

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

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

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

$$= 4 \ln|x+1| - 3 \ln|x-2| + \ln|x+3|$$

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

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