

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

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

$$= (x+3)(x-1) \therefore x=1, x=-3$$

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

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

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

when  $x=1$

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

$$8 = A(0) + 4B$$

$$\frac{8}{4} = B$$

$$B = 2$$

when  $x=-3$

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

$$11+9 = -4A + 0$$

$$\frac{20}{-4} = A$$

$$A = -5$$

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

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

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

2

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

$$\frac{4x-16}{(x)(x-2)} = \frac{A}{x} + \frac{B}{(x-2)} \quad x=0, x=2$$

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

$$4x-16 = A(x-2) + Bx$$

when  $x=0$

$$4(0)-16 = A(0-2) + B(0)$$

$$\frac{-16}{-2} = \frac{-2A}{-2} + 0 \quad A=8$$

when  $x=2$

$$4(2)-16 = A(2-2) + 2B$$

$$8-16 = 0 + 2B$$

$$\frac{-8}{2} = \frac{2B}{2} \quad B=-4$$

$$\int \frac{4x-16}{(x)(x-2)} = \int \frac{8}{x} + \int \frac{-4}{(x-2)}$$
  
$$\equiv 8 \ln x - 4 \ln(x-2)$$

$$\textcircled{3} \text{ Partial } \left\{ \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} \right.$$

$$\left\{ \begin{aligned} \frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)} &= \frac{A}{(x+1)} + \frac{B}{(x-2)} + \frac{C}{(x+3)} \\ 2x &= A(x-2)(x+3) + B(x+1)(x+3) + C(x+1)(x-2) \end{aligned} \right.$$

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

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

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

When  $x = -1$

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

$$2 + 9 - 35 = -6A + 0 + 0$$

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

when  $x = 2$

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

$$8 - 18 - 35 = 0 + 15B + 0$$

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

when  $x = -3$

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

$$18 + 27 - 35 = 0 + 0 + 10C$$

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

cont. (3)

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