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①

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

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

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

f(1)

$$11-3(1) = A(4) + B(0)$$

$$8 = 4A$$

$$A = 2$$

f(-3)

$$11-3(-3) = A(0) + B(-3-1)$$

$$11+9 = 4B$$

$$20 = -4B$$

$$B = -5$$

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

$$\begin{aligned} &= \text{let } u = (x-1) \\ \frac{du}{dx} &= 1 \therefore du = dx \end{aligned}$$

$$\int \frac{2}{u} du = 2 \int \frac{1}{u} du$$

$$2 \ln u = 2 \ln(x-1)$$

$$\text{let } u = (x+3)$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$-\int \frac{5}{u} du$$

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

$$-5 \ln u$$

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

$$\text{Answer} = 2 \ln(x-1) - 5 \ln(x+3)$$

②

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

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

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

$$\begin{aligned} f(-1) &= 4(-1)-16 = A(-4) + B(0) \\ -4-16 &= A-4 \\ A &= 5 \end{aligned}$$

$$\begin{aligned} \text{for } f(3) &= 4(3)-16 = A(0) + B(4) \\ 12-16 &= 4B \\ -4 &= 4B \\ B &= -1 \end{aligned}$$

$$\begin{aligned} \int \frac{4x-16}{(x+1)(x-3)} &= \frac{5}{(x+1)} - \frac{1}{(x-3)} \\ &= \int \frac{5 dx}{(x+1)} - \int \frac{1 dx}{(x-3)} \end{aligned}$$

$$\begin{aligned} \text{let } u &= x+1 \\ \frac{du}{dx} &= 1 \therefore du = dx \end{aligned}$$

$$\int \frac{5}{u} du$$

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

$$5 \ln u = 5 \ln(x+1)$$

$$\text{let } u = x-3$$

$$\begin{aligned} \frac{du}{dx} &= 1 \\ du &= dx \end{aligned}$$

$$-\int \frac{1}{u} du$$

$$= \ln u$$

$$= -\ln(x-3)$$

Answer =

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

③

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

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

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

for + (2)

$$2(2)^2 - 9(2) - 35 = A(0)(5) + B(3)(5) + C(3)(0)$$

$$2(4) - 18 - 35 = 15B$$

$$-45 = 15B$$

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

$$B = -3$$

for (-1)

$$2(-1)^2 - 9(-1) - 35 = A(-3)(2) + B(0)(2) + C(0)(-3)$$

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

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

$$A = 4$$

for (-3)

$$2(-3)^2 - 9(-3) - 35 = A(-3-2)(0) + B(-3+1)(0) + C(-2)(5)$$

$$C(-2)(-5)$$

$$2(9) + 27 - 35 = 10C$$

$$10 = 10C$$

$$C = 1$$

$$A = 4 \quad B = -3 \quad C = 1$$

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

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

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$$\text{let } u = x + 1$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$\text{let } u = x - 2$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$\text{let } u = x + 3$$

$$\frac{du}{dx} = 1$$

$$du = dx$$

$$4 \int \frac{1}{u} du$$

$$4 \ln u$$

$$4 \ln(x+1)$$

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

$$-3 \ln u$$

$$-3 \ln(x-2)$$

$$\int \frac{1}{u} du$$

$$\ln u$$

$$\ln(x+3)$$

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

Answer:

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