

Test for $x=3$

$$4 \times 3 - 16 = A [3-3] + B [3+1]$$

$$12 - 16 = 0 + 4B$$

$$-4 = 4B$$

$$B = \frac{-4}{4} = -1 \quad A = 1$$

F(-1)

$$4(-1) - 16 = B [-1-3]$$

$$-20 = B [-4]$$

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

$$B = 5$$

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

$$\int \frac{-1}{x-3}$$

$$u = x-3 \quad \frac{du}{dx} = 1 \quad dx = du$$

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

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

$$\int \frac{5}{x+1}$$

$$u = x+1, \frac{du}{dx} = 1 \quad dx = du$$

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

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

$$= 5 \ln u$$

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

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

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

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QUESTIONS

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

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

Multiply through by the common L.C.M. (x^2+2x-3)

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

F[1]

$$11-3[1] = A[1+3] + B[1-1]$$

$$11-3 = 4A + 0$$

$$8 = 4A$$

$$A = 2$$

F[-3]

$$11-3x-3 = A[-3+3] + B[-3-1]$$

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

$$20 = -4B$$

$$B = -5$$

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

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

2. $\int \frac{4x-16}{x^2-2x} dx$ $\frac{4x-16}{(x+1)(x-2)} = \frac{A}{x+1} + \frac{B}{x-2}$

$$4x-16 = A(x-2) + B(x+1)$$

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

Solution

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

Multiply both denominator by $(x+1)(x+2)(x+3)$

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

To find A put $x = -1$

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

$$\frac{-23}{2} = \frac{2A}{2}, \quad A = \frac{-23}{2}$$

To find B put $x = -2$

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

$$-9 = -B$$

$$B = 9$$

To find C put $x = -3$

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

$$10 = 2C$$

$$C = 5$$

$$\frac{2x^2 - 9x - 35}{(x+1)(x+2)(x+3)} = \frac{-23}{2(x+1)} + \frac{9}{x+2} + \frac{5}{x+3}$$