

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

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

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

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

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

Resolving into partial fraction

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

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

Equate the numerators

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

Substitute $x=2$

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

$$-49 = +45B$$

$$+15 \quad -15$$

$$B = -\frac{49}{45}$$

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

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

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

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

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

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

The denominator = x^2-2x-3

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

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

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

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

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

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

Equate the numerator

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

Substitute $x=3$

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

$$12 - 16 = 3A + A + 0$$

$$-4 = 4A$$

$$A = -1$$

Substitute $x = -1$

$$2(-1)^2 - 7(-1) - 35 = A(-1-2) + B$$

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

$$\therefore A = -4$$

Substitute $x = -3$

$$2(-3)^2 - 7(-3) - 35 = C(-3+1)(-3-2)$$

$$\frac{10}{10} = \frac{10C}{10}$$

$$\therefore C = 1$$

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

$$(x+1)(x-2)(x+3)$$

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

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

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

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

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

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

The denominator = x^2+2x-3

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

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

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

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

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

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

Equate the numerator

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

Substitute $x=1$

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

$$11-3 = A - A + B + 3B$$

$$\frac{8}{4} = \frac{4B}{4} \therefore B=2$$

Substitute $x=-3$

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

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

$$11+9 = -3A - A - 3B + 3B$$

$$\frac{20}{-4} = \frac{-4A}{-4} \therefore A=-5$$