

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

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

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

$$\frac{11-3x}{x^2+2x-3} = \frac{A}{(x+3)} + \frac{B}{(x-1)}$$

$$\frac{11-3x}{x^2+2x-3} = \frac{A(x-1) + B(x+3)}{(x+3)(x-1)}$$

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

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

$$\text{Let } x = +1$$

$$11 - 3(1) = B(1+3), \quad 8 = B(4) \quad B = 2$$

$$\text{Let } x = -3 \quad 11 - 3(-3) = A(-3-1), \quad 20 = A(-4)$$

$$A = -5 //$$

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

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

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Maths 104 assignment.

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

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

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

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

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

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

let $x = +3$

$$4(3)-16 = B(3+1), \quad 12-16 = B(4), \quad -4 = 4B$$

$$B = -1$$

let $x = -1$

~~$$4(-1) = A(-1-3)$$~~

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

$$-20 = A(-4), \quad A = 5 //$$

$$\int \frac{4x-16}{\sqrt{x^2-2x-3}} dx = \int \frac{5}{\sqrt{(x+1)}} dx + \int \frac{-1}{\sqrt{(x-3)}} dx$$

$$\int \frac{4x-16}{\sqrt{x^2-2x-3}} dx = 5 \ln|x+1| - \ln|x-3| + C //$$

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Maths 104 assignment.

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

$$(x+1)(x-2) = x^2 - x - 2$$

$$(x+1)(x+3) = x^2 + 4x + 3$$

$$(x-2)(x+3) = x^2 + x - 6$$

$$2x^2 - 9x - 35 = A + B + C$$

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

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

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

$$2x^2 - 9x - 35 = Ax^2 + Ax - 6A + Bx^2 + 4Bx + 3B + Cx^2 - Cx - 2C$$

$$2x^2 - 9x - 35 = Ax^2 + Bx^2 + Cx^2 + Ax + 4Bx - Cx - 6A + 3B - 2C$$

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

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

$$A+B+C = 2 \quad \text{--- (i)}$$

$$A+4B-C = 9 \quad \text{--- (ii)}$$

$$-6A+3B-C = -35 \quad \text{--- (iii)}$$

Substitute $B = -3, C = 1$ into eq. (i)

$$A - 3 + 1 = 2$$

$$A = 2 + 2, \quad A = 4$$

To eliminate A

$$\text{eq. (ii)} - \text{eq. (i)} = 3B - 2C = 7 \quad \text{--- (iv)}$$

$$\text{eq. (iii)} - 6 \text{eq. (i)} = 9B + 4C = -23 \quad \text{--- (v)}$$

Solving eq. (iv) and (v) simultaneously

$$4 \times \text{eq. (iv)} \Rightarrow 12B - 8C = 28$$

$$-2 \times \text{eq. (v)} \Rightarrow -18B - 8C = 46$$

$$\frac{30B}{90} \quad \frac{90}{90}$$

$$30B = 90, \quad B = -3 //$$

Substitute $B = -3$ in eqn (iv)

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

$$3(-3) - 2C = 7$$

$$-9 - 2C = 7$$

$$-2C = 16 - 9$$

$$C = -\frac{7}{2}$$

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

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