

$$y=f(x)$$

$$x^n \text{ 적분} \Rightarrow \int x^n dx = \frac{x^{n+1}}{n+1}$$

$$\int x^2 dx = \frac{x^3}{3} + C$$

$$z=f(x,y)=2xy+y^2$$

2중 적분
y에 대해
y입장에서 보는 상투

$$\iint (2xy+y^2) dy dx$$

$$\left[2x \frac{y^2}{2} + \frac{y^3}{3} \right]$$

$$\int_2^2 2x^2 dx = 2 \int_2^2 \frac{x^2 dx}{2+1}$$

$$\int x^2 y dx = ? = y \int x^2 dx = y \times \frac{x^3}{3}$$

1로 적분

$$\int_1^2 \int_1^2 (2xy+y^2) dx = \left[2x \frac{y^2}{2} + \frac{y^3}{3} \right]_1^2$$

2로 대입

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

$$= 2x(2 - \frac{1}{2}) + \frac{7}{3}$$

$$= 3x + \frac{7}{3}$$

$$\int_1^2 (3x + \frac{7}{3}) dx = 3 \int_1^2 x dx + \int_1^2 \frac{7}{3} dx$$

$$= 3 \left[\frac{x^2}{2} \right]_1^2 + \left[\frac{7}{3} x \right]_1^2$$

$$= 3 \left(\frac{4}{2} - \frac{1}{2} \right) + \frac{7}{3}$$

$$= \frac{9}{2} + \frac{7}{3} = \frac{27+14}{6} = \frac{41}{6}$$

2중 적분의 기하학적 의미는? 공면에 대한 부피.



삼중적분

$$y=f(x, x_2, x_3)$$

$$= 3x_1 x_2 x_3^2 + 6x_1^2 x_2 x_3 + 7x_1^3 x_2$$

$$\int_1^2 \int_0^2 \int_1^2 y dx_3 dx_2 dx_1$$

$$\left[3x_1 x_2 \frac{x_3^3}{3} \right]_1^2 + \left[3x_1^2 x_2 x_3^2 \right]_1^2 + \left[\frac{7}{4} x_1^4 x_2 \right]_1^2$$

$$= 3x_1 x_2 \left(\frac{8}{3} \right) + 3x_1^2 x_2 \times 3 + 7x_1^3 x_2$$

$$\left[\frac{7}{2} x_1 x_2^2 \right] + \frac{9}{2} x_1^2 \times 2 + \left[\frac{7}{2} x_1^3 x_2^2 \right]$$

$$\frac{7}{2} x_1 \times 4$$

$$\frac{7}{2} x_1^3 \times 4$$

$$= 14x_1 + 9x_1^2 + 14x_1^3$$

$$= \left[\frac{14}{2} x_1^2 \right]_1^2 + \left[3x_1^3 \right]_1^2 + \frac{7}{2} \left[x_1^4 \right]_1^2$$

$$= 0 + 3(1+1) + \frac{7}{2} \times 0$$

$$= 6$$