2ème ST 2024 / 2025

Tutorial (TD) n° 01 : Integrals

Exercise (01) : Calculeate the following integrals :

$$\int_0^{\sqrt{2}} \frac{x^3+1}{x^2+2}dx, \quad \int_0^{\frac{\pi}{2}} x\cos(x)dx \quad , \int \frac{dx}{\sqrt{x}+\sqrt{x-1}} \quad , \int_0^1 \frac{x^3}{\sqrt{1-x^2}}dx, \quad \int \frac{e^{2x}}{e^x-1}\,dx, \quad , \int \frac{dx}{\sqrt{e^x+1}} \quad ,$$

$$\int_0^{\frac{\pi}{2}} \cos^3(x)dx, \quad \int_0^1 \ln\left(1+\sqrt{x}\right)dx \quad , \int \frac{dx}{x+x(\ln(x))^2} \quad , \quad \int_0^1 \frac{x\ln(x)}{(x^2+1)^2}dx \quad , \quad \int \frac{dx}{3\sin(x)-4\cos(x)}$$

Exercise (02) : Using the Riemann' sum, find the following integral.

$$\int_0^1 (x^2-1)dx$$

Exercise (03) : Compute the following sums :

$$\sum_{k=0}^{+\infty} \frac{n}{(k+n)^2} \quad , \quad \sum_{k=1}^{+\infty} \frac{n^2}{(n+k)^3} \quad , \quad \sum_{k=1}^{+\infty} \frac{1}{\sqrt{4n^2-k^2}} \quad , \sum_{k=1}^{+\infty} \frac{1}{\sqrt{n^2+nk}}$$

Exercise (04) : Calculate the area of D, and calculate the following double integrals :

$$\iint_D (e^{x+y})dxdy \qquad D = \{(x,y) \in \mathbb{R}^2 \quad , \quad 0 \le x \le 2, \quad 1 \le y \le 2\}$$

$$\iint_D \sqrt{x^2+y^2}\,dxdy \quad D = \{(x,y) \in \mathbb{R}^2 \quad , \quad x^2+y^2 \ge 4, \quad x^2+y^2 \le 9\}$$

$\iint_D xy^2dxdy$ D is the triangle of vertices $(0,-1), (3,1)$, et $(0,1)$.

Exercise (05) : Calculate the volume of D, and calculate the following triple integrals :

$$\iiint_D xy\,dxdydz \quad D = \{(x,y,z) \in \mathbb{R}^3 \quad , \quad 0 \le z \le 1 \text{ et } x^2+y^2 \le z^2\}.$$

$$\iiint_D \frac{z}{x^2+y^2+z^2}\,dxdydz \quad D = \{(x,y,z) \in \mathbb{R}^3 \quad , \quad z > 0 \text{ et } 1 \le x^2+y^2+z^2 \le 4\}.$$