Computing surface integrals

1. Computing surface integrals.
2. Computing flux.

Computing line integrals

Handling functions

1. Writing function files in Matlab
2. Using recursive function (if time permits)

Exercise

Computing surface integrals

1. Find the surface integral of $f(x,y,z) = x - z + sin(x)$ on the surface

$$S = \{(x,y,z) \mid x^2 + y^2 + z^2 = 1, -1/2 \leq z \leq 1/2\}$$

2. Find the flux of $\mathbf{F}(x,y,z) = (xy, e^y, x^2 + y)$ over the surface

$$S = \{(x,y,z) \mid z = x^2 - y^2, (x,y) \in [-1,1] \times [-1,1]\}$$

   to the upward direction.

Computing line integrals

1. Find the line integral of $F(x,y) = (x^2, \cos x \sin y)$ along the unit circle $C = \{(x,y) \mid x^2 + y^2 = 1\}$ counter-clockwise direction.
2. Find the line integral of $F(x,y,z) = (xy, e^{x+z}, y^2 + \cos z)$ along the intersection of the cylinder $L = \{x^2 + y^2 = 1\}$ and the surface $S = \{z = x^2 - y^2\}$, with counter-clockwise direction (with respect to z-axis).

Writing functions

1. Write a function `sort_vert` which sorts the vertices of a convex domain counter-clockwise.
   - The inputs are the coordinates of n vertices, represented by $n \times 2$ matrix.
2. Write a function `area_conv` which computes the area of a convex domain.
   - The inputs are the coordinates of n vertices, represented by $n \times 2$ matrix, which are already sorted (counter-)clockwise.