EXERCISES, Week 4 (submit by 08.11.2017)

1. Compute the integral $\iiint_S f(x,y,z)dxdydz$ using spherical or cylindrical coordinates

   (a) $f(x,y,z) = x^2+y^2-z^2$ and $S = \{(x,y,z) \mid 1 \le x^2+y^2+z^2 \le 4,\ x \ge 0,\ y \ge 0\}$,

   (b) $f(x,y,z) = x^2+y^2$ and $S = \{(x,y,z) \mid \frac{x^2+y^2}{2} \le z \le 2\}$,

   (c) $f(x,y,z) = \sqrt{y^2+z^2}$ and S is bounded by surfaces $y^2+z^2 = 1$, $y+x = 1$, $y-x = 1$.

2. Compute the line integral $\int_\gamma xy\,ds$, where γ is the part of the circle $x^2+y^2 = 1$ located in the positive quadrant $\{(x,y) \mid x \ge 0, y \ge 0\}$.

3. Compute the line integral $\int_\gamma z\,ds$, where γ is the helix in $\mathbb{R}^3$, $\{(x,y,z) \mid x = t\cos t,\ y = t\sin t,\ z = t,\ 0 \le t \le 2\pi\}$.

4. Compute $\int_\gamma 2xy\,dx + x^2\,dy$, where γ is the oriented curve $\{(x,y) \mid y = \frac{x^2}{4},\ 0 \le x \le 2\}$ with the orientation from $x = 0$ to $x = 2$.

5. Compute $\int_\gamma (y+z)\,dx + (z+x)\,dy + (x+y)\,dz$, where γ is the oriented curve $\{(x,y,z) \mid x = \sin^2 t,\ y = 2\sin t\cos t,\ z = \cos^2 t,\ 0 \le t \le \pi\}$ with the orientation from $t = 0$ to $t = \pi$.