LIST 3. Scalar Line Integral.

1. Calculate scalar line integrals on lines K:

a) $\int_K (x^2+y)dl$, K: the interval from point A(0,2) to point B(2,4);

b) $\int_K xydl$, K: the ellipse $b^2x^2+a^2y^2=a^2b^2$ and $x\geq 0$, $y\geq 0$.

2. Calculate scalar line integrals on lines K given in polar coordinates:

a) $\int_K \frac{dl}{\left(x^2+y^2\right)^{\frac{3}{2}}}$, K: the hyperbolic spiral $r=\frac{1}{\varphi}$, $\sqrt{3}\leq\varphi\leq 2\sqrt{2}$;

b) $\int_K \sqrt{2y^2+z^2}\,dl$, K: the logarithmic spiral $r=ae^{\varphi}$ from the point A(a,0) to the point B($ae^{2\pi}$,0).

3. Calculate scalar line integrals on lines K:

a) $\int_K (x+z)dl$, K: $x=t$ $y=\frac{3t^2}{\sqrt{2}}$ $z=t^3$ $0\leq t\leq 1$; b) $\int_K \sqrt{2y^2+z^2}\,dl$, K: the circle: $x^2+y^2+z^2=a^2$, $x=y$.

4. Calculate the center of mass of the homogenous cycloid:

$$x=a(t-\sin t) \quad y=a(1-\cos t) \quad 0\leq t\leq\pi$$

5. Calculate the center of mass and the moment of inertia with respect to the point O(0;0;0) of the homogenous helical curve:

$$x=e^t\cos t \quad y=e^t\sin t \quad z=e^t \quad 0\leq t\leq\pi/2$$

6. Calculate the center of mass of homogenous spherical triangle:

$$x^2+y^2+z^2=a^2,\ x>0,\ y>0,\ z>0.$$