Classes 10. Visualization in Wolfram Alpha (plots for 2D and 3D Functions)

Do the following exercises with Wolfram Alpha program.

Exercises

Exercise 1. How to draw in the Wolfram Alpha:

- parabola;
- hyperbole;
- circle;
- ellipse;
- ball;
- second butterfly curve;
- Archimedean spiral;
- pentagon;
- ellipsoid;
- cube;
- pyramid;
- cylinder;
- icosahedron;
- vector field $(x, -y)$.

Exercise 2. Draw a graph of the function:

1. $F(x, y) = x \times y^2$, where $-2 \le x \le 2,\ -3 \le y \le 3$;
2. $F(x, y) = x^3 - y^3 + 1$, where $-2.5 \le x \le 2.5,\ -2 \le y \le 2$;
3. $F(a) = \{\cos a, \sin a, \frac{a}{2}\}$, where $-2\ \text{Pi} \le a \le 2\ \text{Pi}$;
4. $F(u, v) = \{\cos u \sin v, \sin u \sin v, \cos v\}$, where $-2\ \text{Pi} \le u \le 2\ \text{Pi},\ \text{Pi} \le v \le 2\ \text{Pi}$;
5. $F(u, v) = \{4 + (3 + \cos v) \sin u, 4 + (3 + \cos v) \cos u, 4 + \sin v\}$,

where $0 \le u \le 2\ \text{Pi},\ 0 \le v \le 2\ \text{Pi}$.

Exercise 3.

a) Calculate the value of the function

$$\cos\frac{\pi}{12}, \cos\frac{\pi}{8}, \cos\frac{\pi}{4}, \cos\frac{\pi}{3}, \cos\frac{\pi}{2}, \cos\pi, \ln e^{2.5}, arctg\,\sqrt{3}$$

and draw the appropriate points on the plane. Help: (1, $\cos\frac{\pi}{12}$) and so on.

b) Draw a broken line:

(1, $\frac{1}{2}$), (2, $-\frac{1}{3}$), (3, $\frac{1}{4}$), (4, $-\frac{1}{5}$), (5, $\frac{1}{6}$), (6, $-\frac{1}{7}$), (7, $\frac{1}{8}$), (8, $-\frac{1}{9}$), (9, $\frac{1}{10}$).

c) Calculate the area between curves $y = x^4 - 12$ and $y = x^2$. Make a geometric interpretation.

d) Calculate the coordinates (12 significant digits) of the intersection point of the curves

$$x^3 + y^2 = 1,\ x = y^{-1}.$$

e) Calculate an area that satisfy two inequalities

$$x^4 + y^2 < 5, \sin y > 10\,x.$$