

Quadric surfaces

1. Find, which quadric surface is determined by the following equation:

- a) $x^2 + y^2 + z^2 - 2z = 0$
- b) $2x^2 + 2y^2 + z^2 - 8 = 0$
- c) $9x^2 + 9y^2 - 4z^2 - 36 = 0$
- d) $25x^2 + 4y^2 - 100z^2 + 100 = 0$
- e) $(z - 1)^2 = x^2 + y^2$
- f) $x^2 = y^2 + z^2$
- g) $z = 4 + x^2 + y^2$
- h) $x = 1 - y^2 - z^2$
- i) $y = x^2 + z^2$
- j) $(x - 1)^2 + y^2 = 1$
- k) $x^2 + z^2 = 4$
- l) $x = y^2$
- m) $z = 4 - y^2$

Solution: a) sphere with centre $S = [0, 0, 1]$ and radius $r = 1$

- b) ellipsoid with centre $S = [0, 0, 0]$ and semi-axes $a = 2, b = 2, c = 2\sqrt{2}$
- c) 1-sheet hyperboloid with centre $S = [0, 0, 0]$ and semi-axes $a=2, b=2, c=3$
- d) 2-sheet hyperboloid with centre $S = [0, 0, 0]$ and semi-axes $a=2, b=5, c=1$
- e) conical surface of evolution with vertex $V = [0, 0, 1]$ and axis in the coordinate axis z
- f) conical surface of evolution with vertex $V = [0, 0, 0]$ and axis in the coordinate axis x
- g) paraboloid of revolution with vertex $V = [0, 0, 4]$ and axis in the coordinate axis z
- h) paraboloid of revolution with vertex $V = [1, 0, 0]$ and axis in the coordinate axis x
- i) paraboloid of revolution with vertex $V = [0, 0, 0]$ and axis in the coordinate axis y
- j) cylindrical surface of revolution with basic circle $(x - 1)^2 + y^2 = 1$, and with axis and generating lines in direction of coordinate axis z
- k) cylindrical surface of revolution with basic circle $x^2 + z^2 = 4$, and with axis and generating lines in direction of coordinate axis y
- l) parabolic cylindrical surface with basic parabola $x = y^2$, and with generating lines in direction of coordinate axis z
- m) parabolic cylindrical surface with basic parabola $z = 4 - y^2$, and with generating lines in direction of coordinate axis x .