Worksheet for August 27

Problems marked with an asterisk are to be place in your math diary.

1. Find the range, domain of the following functions and use a graphing software to find their graphs. (*)
   (a) $g(x, y) = \sqrt{16 - 4x^2 - y^2}$
   (b) $V(x, y) = 4x^2 + y^2$
   (c) $z = y^2 - x^2$

2. Find the level curves for the functions in problem 1, for the values $C = -2, -1, 0, 2, 5$. First by hand. Then use the 3D calculator here `https://www.geogebra.org/3d?lang=en` to graph the functions together with the level curves. (*)

3. Using online graphing software to create graphs of the following level surfaces known as *quadric surfaces*.
   (i) $\frac{x^2}{3^2} + \frac{y^2}{4^2} + \frac{z^2}{5^2} = 1$.(Ellipsoid)
   (ii) $\frac{x^2}{3^2} + \frac{y^2}{4^2} - \frac{z^2}{5^2} = 1$ (Hyperboloid of one sheet)
   (iii) $\frac{x^2}{3^2} + \frac{y^2}{4^2} - \frac{z^2}{5^2} = -1$ (Hyperboloid of two sheets)
   iv) $\frac{x^2}{3^2} + \frac{y^2}{4^2} - z = 0$ (Elliptic Paraboloid)
   (v) $\frac{x^2}{3^2} + \frac{y^2}{4^2} - \frac{z^2}{5^2} = 0$ (Elliptic Cone)