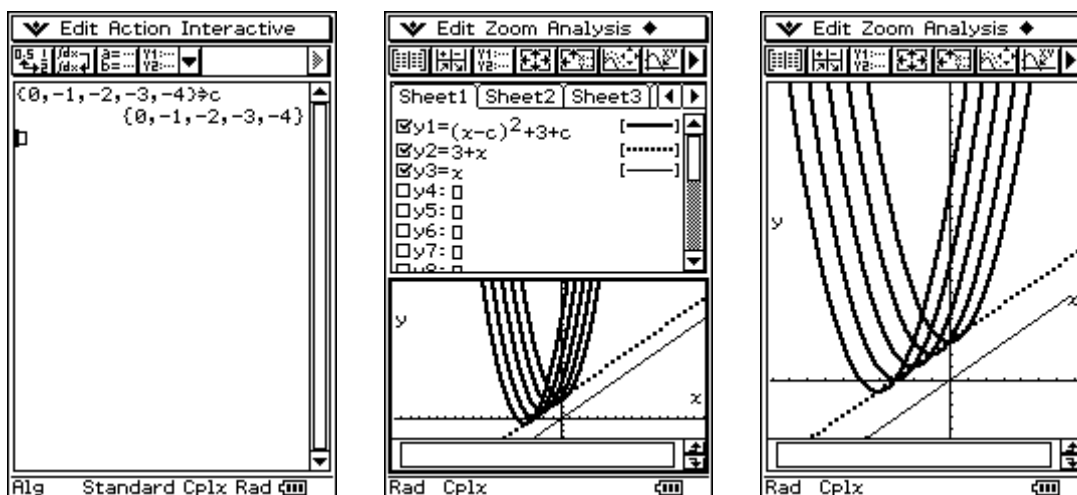


Workshop II (Ciechocinek, Poland, 29th June 2004) Several aspects of 3D-graphics with the ClassPad300

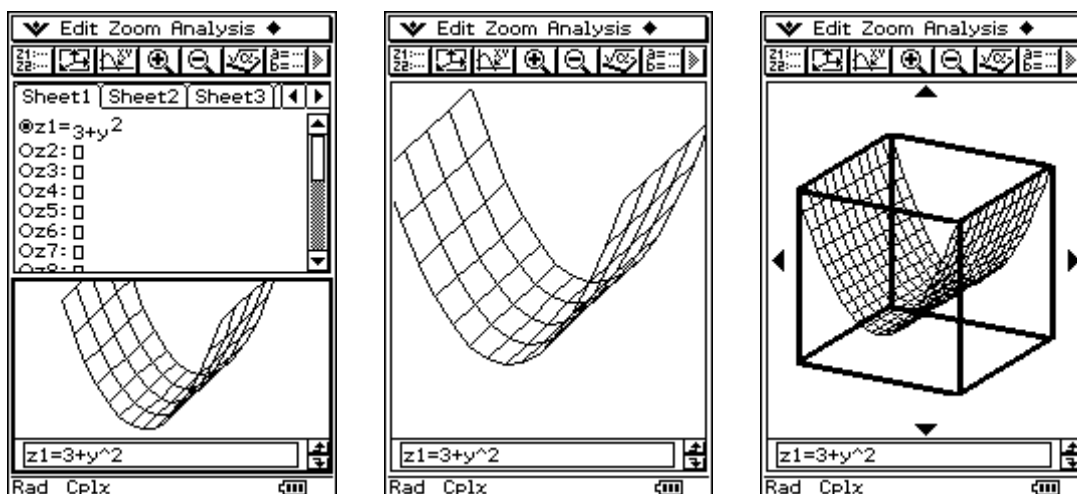
Let's beginning with a simple graphics (parabolic cylinder $z = f(x,y) = 3 + y^2$):

First we draw the parabolas $y = y(x) = (x - c)^2 + 3 + c$, $c = \{0, -1, -2, -3, -4\}$, in the Graph&Table menu (2D-graphics), where we input the list c in main-menu:



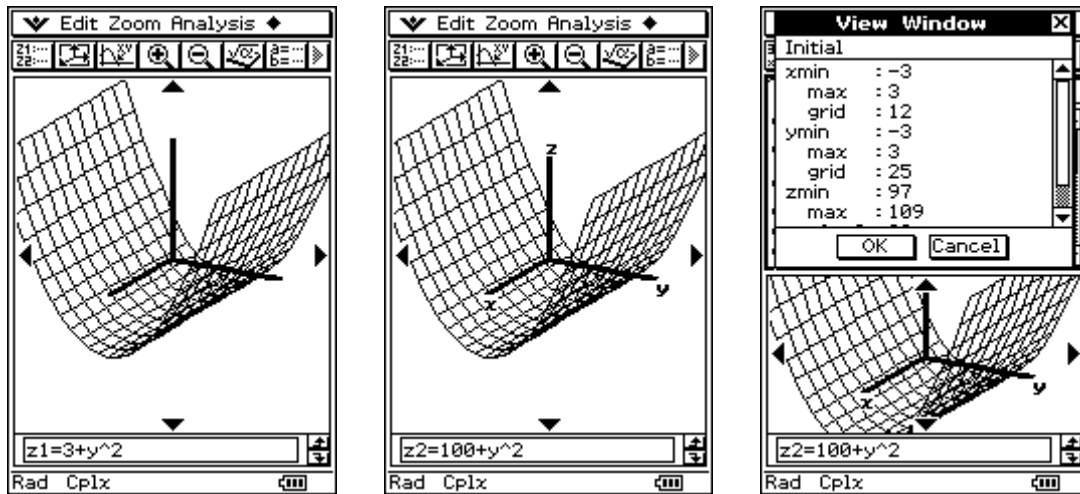
With some imagination we discover in the third screenshot a horizontal parabolic cylinder.

Now we think to get a 3D-graphics, where the line $y = x$ denotes the x-axis, the horizontal line the y-axis and the vertical line the z-axis, i.e. the horizontal parabolic cylinder $z = 3 + y^2$ is situated three units over the x-axis. Let us draw the discussed situation in a 3D-graphics by the help of the 3D-Graph-menu of the ClassPad300 (view-window: $-3 \leq x \leq 3$, $-3 \leq y \leq 3$, $0 \leq z \leq 12$):

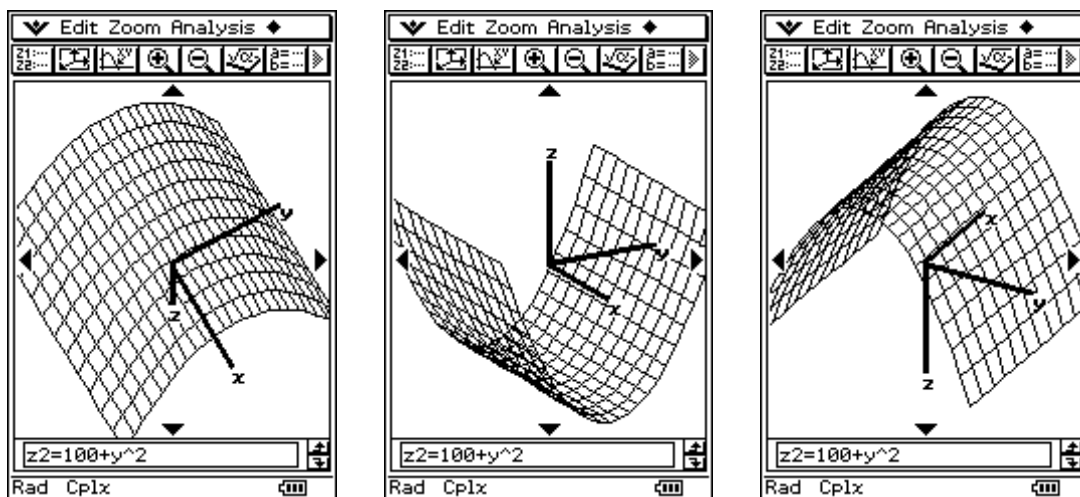


We get a good imagination, if we draw the surface in a 3D-box, where the edges of the box are not the axis of the coordinate system – only the directions of the axis. (This is clear.)

Now we draw the parabolic cylinder without a box but with the axis of the coordinate system. Again it is clear, the directions of the shown axis are only the directions for the own orientation and not the real axis. E.g. draw the parabolic cylinder $z = 100 + y^2$, then you get the same picture!



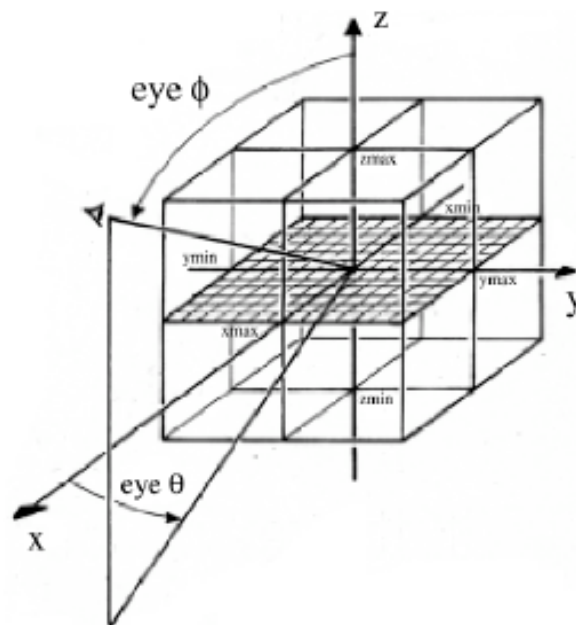
Now we have an other view of the surface $z = 100 + y^2$, i.e. our eyes are in an other position:



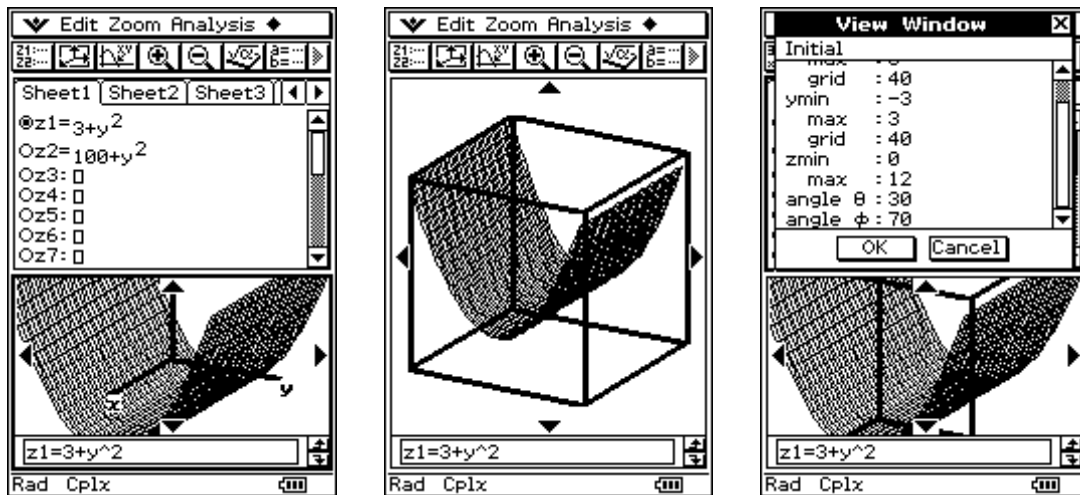
Again, it is clear, the directions of the shown axis are only the directions for the own orientation and not the real axis of coordinate system in the surface $z = 100 + y^2$.

The eye-angles (in degree) we can input In the view-window setup.

(The default angles are $\theta = 20^\circ$, $\phi = 70^\circ$)



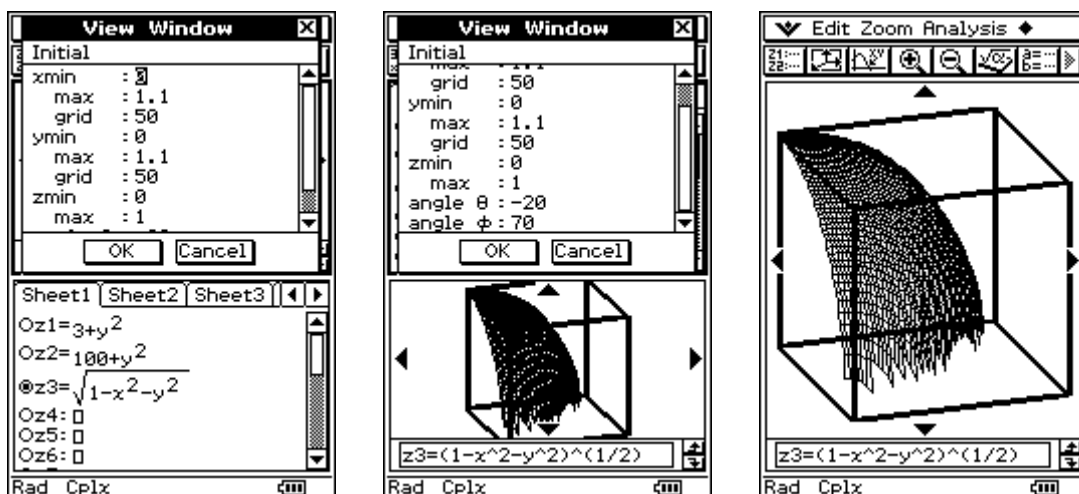
Finally draw the 3D-graphics $z = 3 + y^2$ ($-3 \leq x \leq 3$, $-3 \leq y \leq 3$) in the following manner:



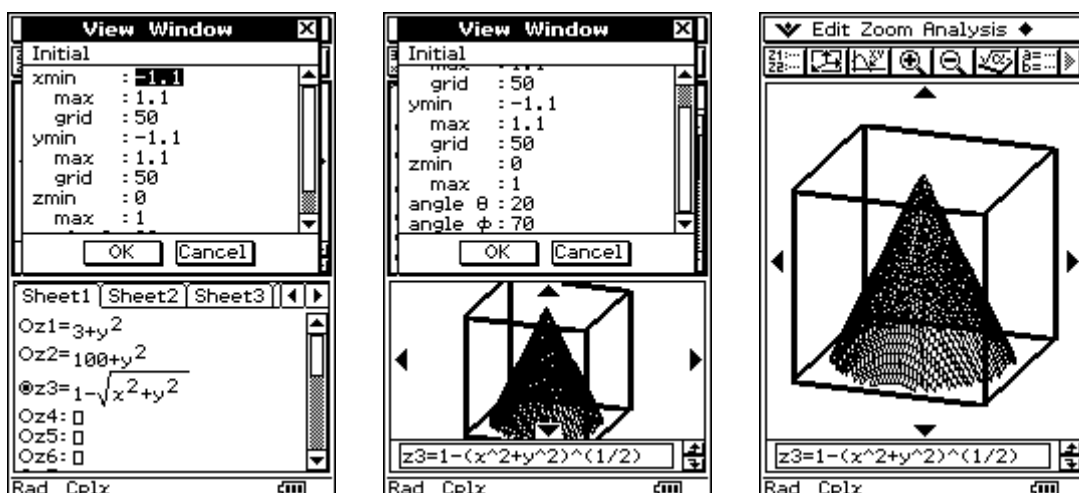
We see some lighting effects: the right side (back side is darker)

Now consider several 3D-graphics:

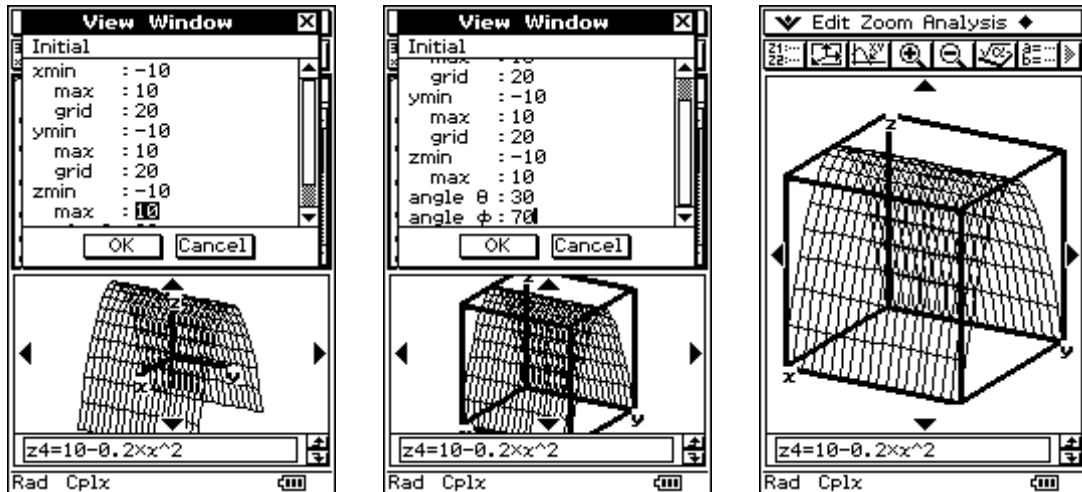
1. the part of a sphere, which is situated in the first of the eight parts of the 3D-room (with $x \geq 0$, $y \geq 0$, $z \geq 0$): $z = (a^2 - x^2 - y^2)^{0.5}$



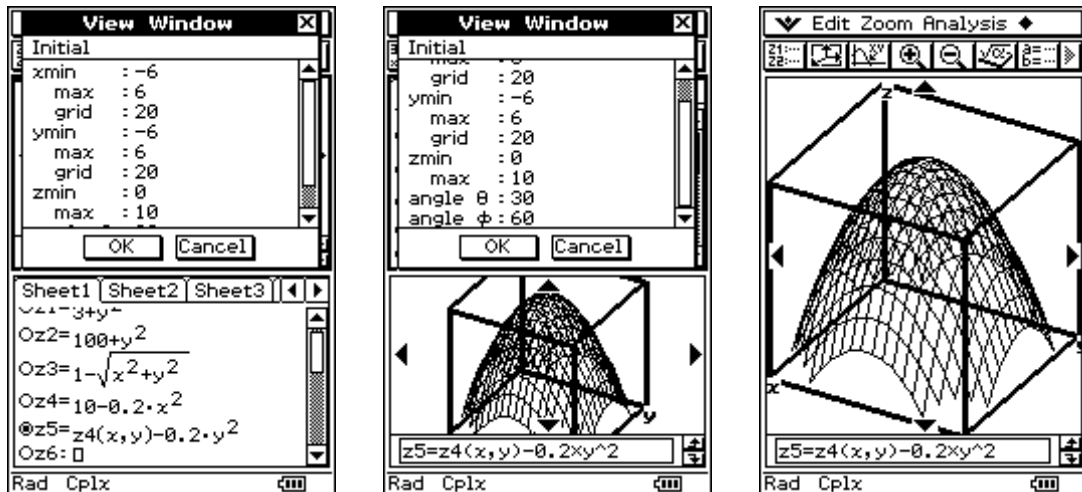
2. a cone: $z = zmax - a * (x^2 + y^2)^{0.5}$



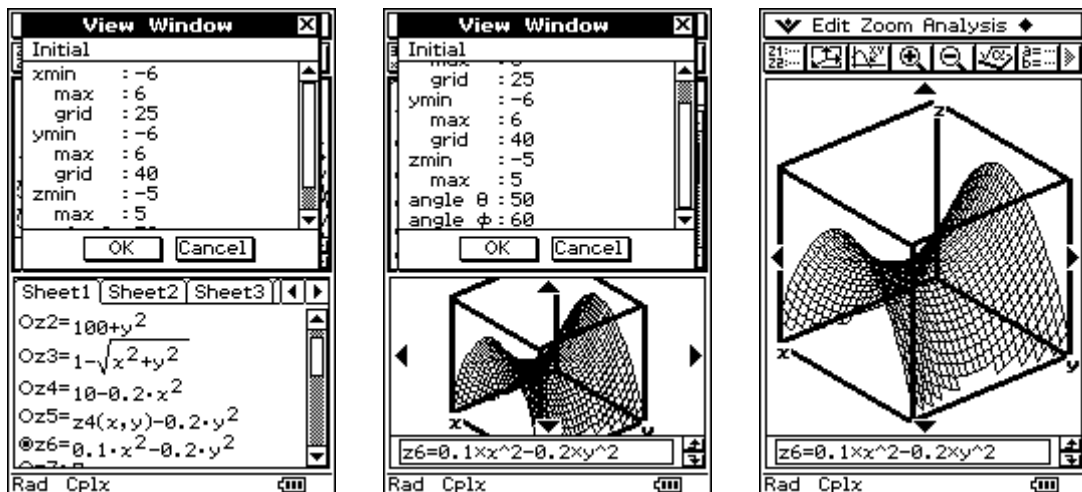
3. again a parabolic cylinder (a “rampart”): $z = z_{\max} - a * x^2$



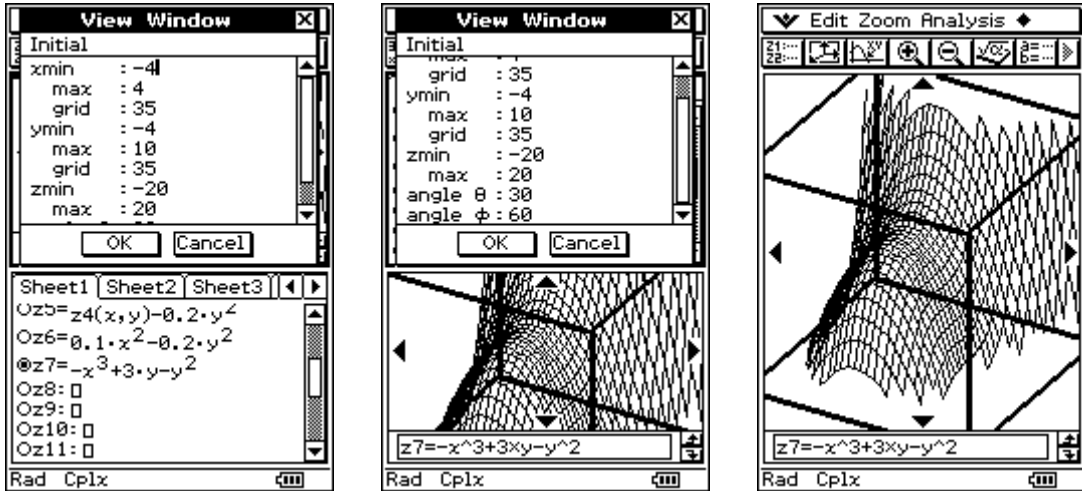
4. a paraboloid of revolution (a “hill” or “mountain”): $z = z_{\max} - a * x^2 - b * y^2$



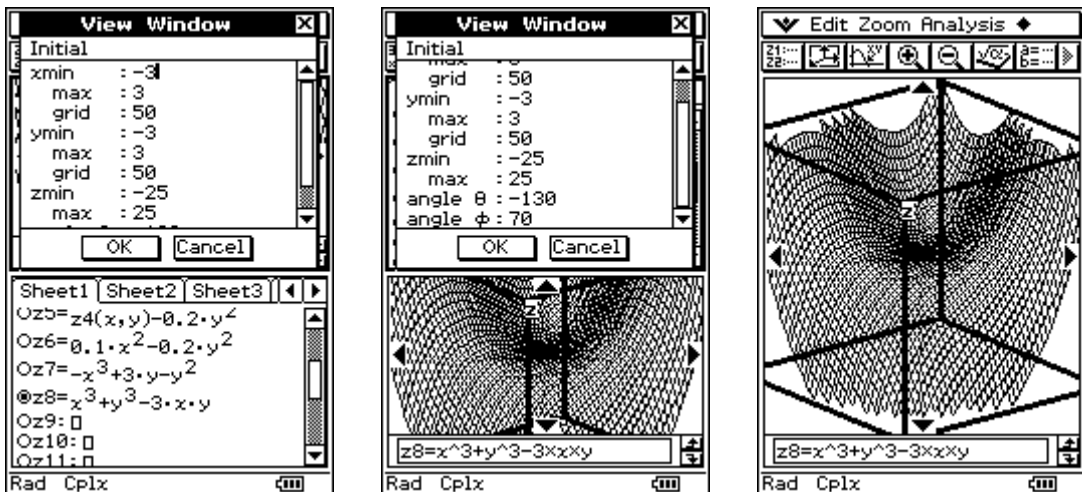
5. a hyperbolic paraboloid (“saddle surface”): $z = a * x^2 - b * y^2$



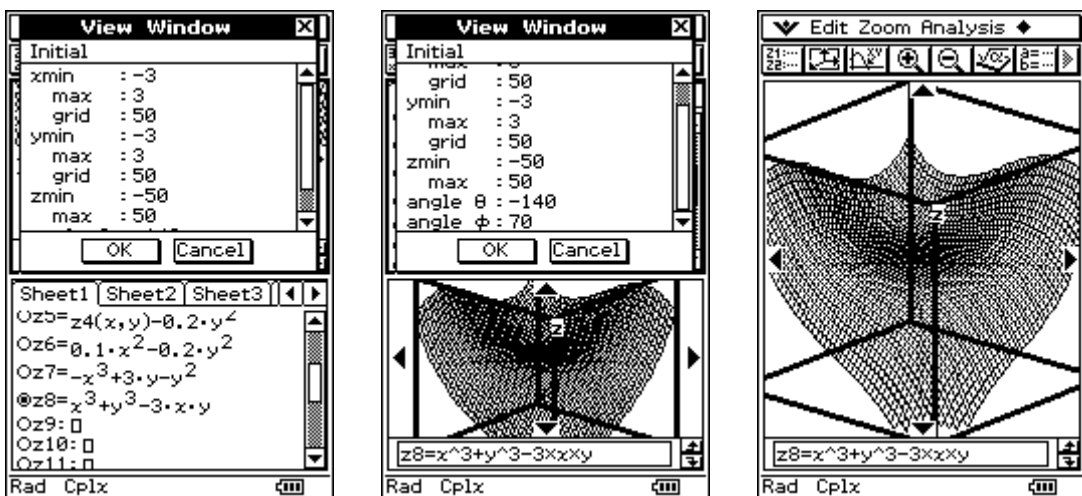
6. a surface of third order (“mountain ridge with mountain road”): $z = -x^3 + a \cdot y - y^2$



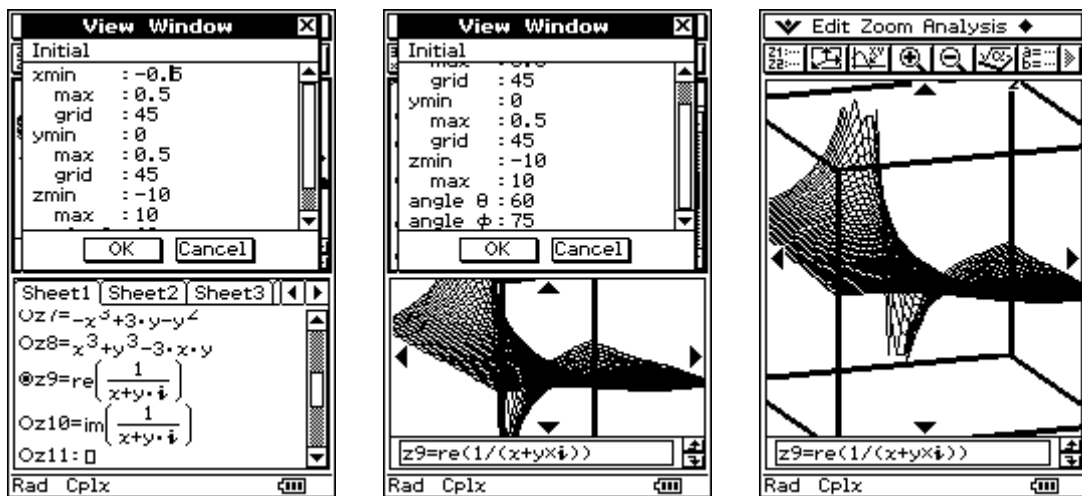
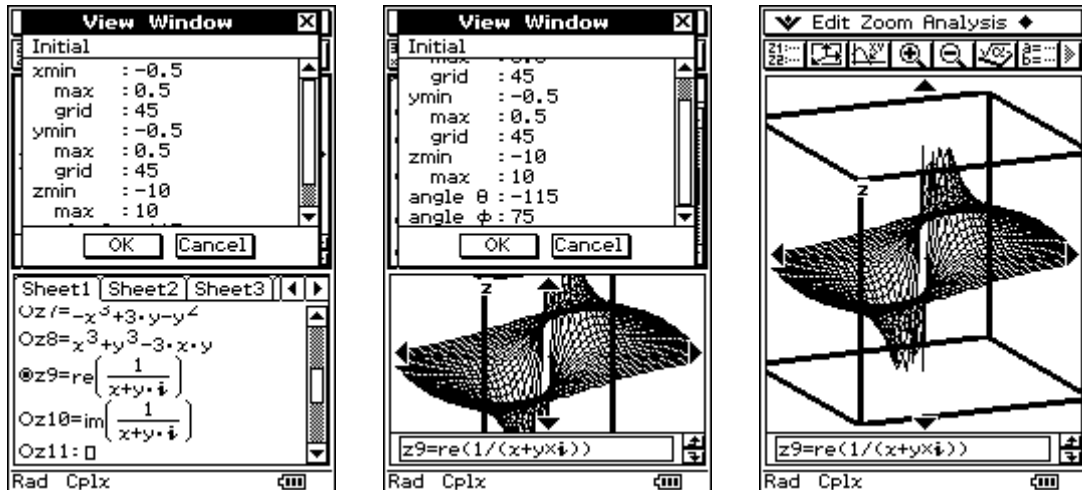
7. a surface of third order (“mountain ridge with lookout platform”): $z = x^3 - a \cdot x \cdot y + y^3$



now the view-window is changed:

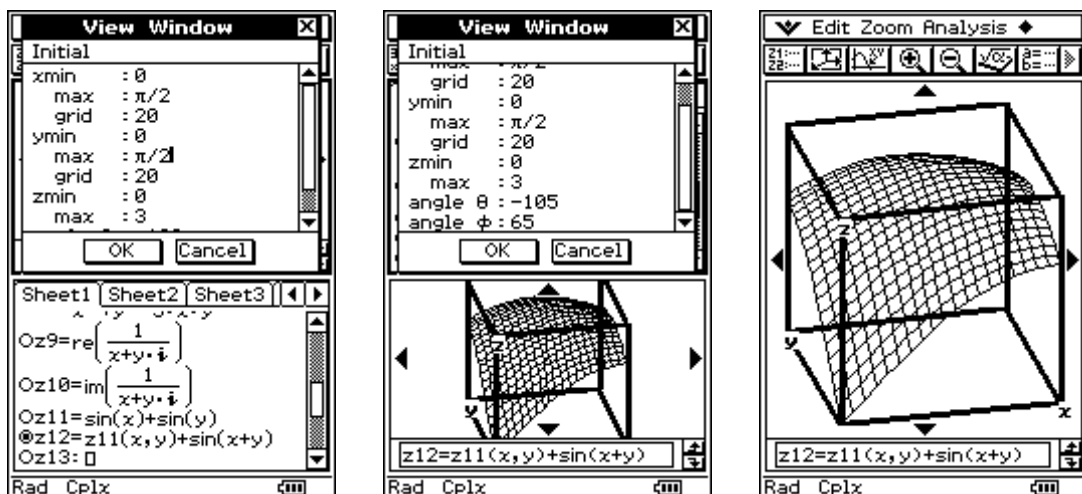


8. real part and imaginary part of a complex function: $z1 + j \cdot z2 = 1 / (x + j \cdot y)$, i.e.
 $z1 = z(x,y) = x / (x^2 + y^2)$ and $z2 = z(x,y) = -y / (x^2 + y^2)$



This graphics is a better one then drawing on the blackboard by the help of chalk.

9. a part of the periodic surface: $z = \sin(x) + \sin(y) + \sin(x+y)$



What is the general design of this periodic surface? Find out $P(x_{max}, y_{max}, z_{max})$!