EXERCISES

Mathematica 6 ~ Lab Number 2

Problem 1. Use **Plot3D** to plot the function

$$f(x,y) = \sin\left\{\pi \sin(x) + y\right\}$$

on the region $-3 < x, y < 3$. Install the options
Boxed->False
Axes->None

Do the same after having installed the additional option **Mesh->40**.

Problem 2. The equations

$$\begin{aligned} x^2 \ + y^2 \ &= 1 \\ x^3 \ + y^3 \ &= 1 \\ x^{10} + y^{10} &= 1 \end{aligned}$$

provide implicit descriptions of a couple of curves, of which the first is familiar, the others aren't. Construct superimposed representations of the solutions of those three equations, subject to the stipulation that $-1.5 < x, y < 1.5$.

Do the same after having turned off the frame, turned on a pair of axes, and having installed this further option:
ContourStyle->{{Red,Thick},{Green,Thick, Dashed},{Blue,Thick}}.

Problem 3. We have seen that graphs of $x^{2p} + y^{2p} = 1$ become "more and more nearly square" as p advances through the integers. The following figure illustrates the same phenomenon: use **Plot3D** to display the function

$$g(x,y) = e^{-(x^8 + y^8)}$$

on the region $-2 < x, y < 2$, with these installed options:
Ticks->False, **Mesh->25**.

Now do the same after installation of this additional option:
PlotPoints->50. Note the improved resolution.

Problem 4. The equations

$$x(s,t) = s\cos(2\pi s + t)$$
$$y(s,t) = s\sin(2\pi s + t)$$

describe a t-indexed set of s-parameterized curves. Use **ParametricPlot** to draw the curve produced at $t = 0$ as s ranges $0 \leqslant s \leqslant 10$.

Use **Manipulate** to construct a demonstration of how the curve is altered as t ranges on the interval $0 \leqslant t \leqslant 2\pi$.