February 05, 2011 Lecturer Dmitri Zaitsev Hilary Term 2011

Course 2318 2011

S h e e t 2

Due: at the end of the tutorial on Thursday of the next week

Exercise 1

Show that the following set in the plane $\mathbb{R}^2$ is a quadric and determine its type:

(i) The set of points p which are at equal distances from a point and a line.

(ii) The set of points p with

$$d(p,a) + d(p,b) = \text{const},$$

where a and b are given points and $d(p,a)$ is the distance from p to a.

(iii) The set of points p with

$$d(p,a) - d(p,b) = \text{const},$$

where a and b are given points.

Hint. Write the equation for the distances and eliminate square roots by rearranging the terms and repeatedly squaring both sides.

Exercise 2

Show by giving explicit transformations that any ellipse, hyperbola and parabola are projectively equivalent, i.e. can be transformed into each other.