

## Mth 611 Assignment 2 | Name:

Bent Petersen 611s2005-002.tex Due date: Fri April 15, 2005 17:10

**Instructions:** Please supply your solution(s) by the due date in the space provided below. Continue on to the back of the sheet if you need more space. Do not turn in any additional paper. For additional comments and instructions check my webpage <http://oregonstate.edu/~peterseb>

**Problem 2.1** Let  $z$  and  $z^*$  be symmetric with respect to the “circle”  $\Gamma$ . Recall this means if  $S$  is a Möbius transform with  $S(\Gamma) = \mathbb{R}_\infty$  then  $S(z^*) = \overline{S(z)}$ . Show that each “circle” which passes through  $z$  and  $z^*$  is orthogonal to  $\Gamma$ . (**Hint:** One or two well-chosen short sentences should suffice.)

**Problem 2.2** Let  $\Gamma$  be a circle with center  $c$  and radius  $r$ . Let  $z^*$  be the reflection of  $z$  in  $\Gamma$ . Then

$$z^* = \overline{T(z)}$$

where  $T$  is the Möbius transform

$$T(z) = \frac{\bar{c}z + r^2 - |c|^2}{z - c}.$$

**Hint:** Let

$$R(z) = \frac{1}{i} \frac{z - r - c}{z + r - c}$$

and compute  $R(c + re^{i\theta})$  for all  $\theta$  or just for  $\theta = 0, \pi/2, \pi$ .