

## Assignment M

This is a special assignment on inversion. This is the material we cover online only, to make up for the lecture time lost due to inclement weather. It contains only one question.

### Question to be answered in writing

1. Prove that inversion preserves the angle of two circles, using the statements on our handout “Inversion in the complex plane”, in the special case when the center of the base circle and the centers of the two other circles are collinear. Assume the center of the base circle is 0 and its radius is 1. Assume the two circles to be inverted have their centers  $O_1$  and  $O_2$  on the real line, at  $c_1$  and  $c_2$  respectively, and that they have radius  $r_1$  and  $r_2$  respectively. Assume the point  $P$  is an intersection of these circles. Using the law of cosines, express the cosine of  $\angle O_1PO_2$  in terms of  $c_1, c_2, r_1, r_2$ . Let  $O'_1, O'_2$  and  $P'$  the image of  $O_1, O_2$  and  $P$  under the inversion. Using the formulas on our handout, show that  $\angle O'_1P'O'_2$  has the same cosine.