Homework for February 24, 2019.

Geometry.

Review the classwork handout on inversion. Solve the unsolved problems from the previous homework. Solve the exercises and the following problems.

Problems.

- 1. Given circle *C* and its image *C*' of find the inversion circle, S, which transforms one into another. Consider three cases:
 - a. circles *C* and *C*' are crossing, i.e. have two common points
 - b. circles *C* and *C*' are touching, i.e. have one common point
 - c. circles *C* and *C*' have no common points
- 2. Find the distance between two parallel straight lines that are images of the two circles with the radii r_1 and r_2 , which are tangent at the center O of the inversion circle S with radius R.
- 3. Express the similarity coefficient between circle *L* and its image *L'* through radius of the inversion circle *R* and length of the tangent, |OT|. What happens if |OT| = R?
- 4. Consider inversion with respect to circle *S* centered at the origin, (0,0). Image of point P(x, y) is point P'(x', y'). Prove that the transformation of coordinates is (see figure),

$$x' = x \frac{R^2}{x^2 + y^2}$$
$$y' = y \frac{R^2}{x^2 + y^2}$$



- 5. What is the image of the line y = ax + b?
- 6. Show that in the case $a \neq r$ there exist x_0, y_0, r_0 , such that the image of circle $(x a)^2 + y^2 = r^2$ is circle $(x' x_0)^2 + (y' y_0)^2 = r_0^2$.