# MAT 515 Homework 12 - Fall 2016

Please hand in problems 1 to 5 and problems 6-7 separately.

1. Prove that the composition of two similarity transformations is a similarity transformation and that the inverse of a similarity transformation is a similarity transformation .

2. Prove that if $P, A$ and $A_1$ are points then $D_{P,k} \circ R_{A,P,A_1} = R_{A,P,A_1} \circ D_{P,k}$. Is it true that $D_{P,k} \circ R_{A,Q,A_1} = R_{A,Q,A_1} \circ D_{P,k}$ for a point $Q \neq P$. Justify your answer.

3. Prove that if $P$ is a point in a line $\ell$ then $D_{P,k} \circ r_\ell = r_\ell \circ D_{P,k}$. Is it true that $D_{Q,k} \circ r_\ell = r_\ell \circ D_{Q,k}$ if $Q$ is a point not in the line $\ell$.

4. Prove that if $S$ is a map from the plane to itself preserving lines and angles then $S$ is a similarity transformation.

5. Prove that a similarity transformation preserves angles and circles.

6. Write a few paragraphs about the Cinderella constructions we made. Explain, as much as you can the mathematics behind them and what you learned. This homework will not be graded, but I will read your notes and give you feedback. Feel free to add pictures, and/or screenshots. Think that you are writing notes for a student who could not come to class.

7. Extra Credit: Given two similar triangles and $\triangle ABC$, $\triangle A_1B_1C_1$ Do a geometric construction to find the center of a stretch reflection that maps $\triangle ABC$ to $\triangle A_1B_1C_1$ (as we did in class for a stretch rotation.) You can try to solve the whole problem, or a some special cases (Possible special cases: 1) the points $A, B, A_1, B_1$ are collinear; 2) $A = A_1$)