MA 341 Homework #7
Due Friday, November 9, in Class

1. Begin preparing for Exam #3, which will take place on on Friday, November 16.

2. Exercise 0.9 of the "Isometry Problems I" (Problem 7.2.1 of the Course Notes). Be sure your diagrams are clear and neat.

3. Exercise 0.10 of the "Isometry Problems I" (Problem 7.2.7 of the Course Notes). Be sure your diagrams are clear, and that it is clear how you obtained the isometry elements by a systematic procedure and not simply estimation by eye.

4. What is the net effect of first rotating a figure by 90 degrees counterclockwise about the point $(5, 0)$ and then rotating the resulting figure by 90 degrees counterclockwise about the point $(1, 0)$? I strongly suggest first experimenting with GeoGebra. Then prove your answer by using our rotation formulas.

5. Exercise 7.2.10. Justify your answers.

6. The following equations describe a rotation by a certain angle ϕ about a certain point P. Determine $\sin\phi$, $\cos\phi$, and the coordinates of P. Show your work.

$$x_2 = -\frac{3}{5}x_1 - \frac{4}{5}y_1,$$

$$y_2 = \frac{4}{5}x_1 - \frac{3}{5}y_1 - 4.$$

7. Assume P is a point and ℓ is a line. Let f be the isometry that is a rotation around P by 180 degrees, and g be the isometry that is a reflection across ℓ.

   (a) Explain why it must be true that if P lies on ℓ, then $fg = gf$. Include a good diagram (e.g., made with GeoGebra).

   (b) Make a good diagram (e.g., with GeoGebra) to show an example in which P does not lie on ℓ and $fg \neq gf$.