

Math 396 - Writing Assignment 1

Due March 4, 2015

1 Overview

Your assignment is to create a lesson plan for the specific math topic described in Section 4, below. Assume the class you are teaching meets each day for one hour. The lesson plan itself should cover between one and three class days (depending on what you feel is appropriate for the material).

For this activity, imagine you are in the fairly idealized situation in which your class consists of about 20 high school students who are all well-prepared for the lesson. You may assume also that each high school student is fairly talented. One of the underlying goals is for you to think about how to best structure the material in a way that is most conducive for learning the material, at least in an idealized situation. In that sense, this activity is more about structuring knowledge.

2 What you need to hand in

You should hand in the following:

- A brief *outline* of the order of events for the entire one-to-three day lesson you are planning.
- An *overall description* of why you made the choices you did in designing your lesson plan. For example, you should address why you designed the homework assignment to cover material XYZ, as opposed to ABC which is addressed in the in-class activity.
- At least one *in-class activity*. This is something that is intended for your students to complete during class. It can be a group or individual activity. You are free to make more than one, if you feel it is appropriate, but please limit yourself to at most three in-class activities.

Each in-class activity should include a separate *solution key*. If you intend for an in-class activity to be graded, then you should provide a *rubric* as well that indicates how you will grade it.

- At least one *homework assignment* for your students. Each homework assignment should include a separate *solution key* and *rubric*, if appropriate. Once again, please limit yourself to at most three homework assignments.
- Your *lecture notes*, if you plan on presenting some of the material yourself. (Note: You are not required to present any material yourself. This just says that if you decide to present something, then you should tell me how you plan on doing this.) This is where you would address any examples, computations, demonstrations, etc. that you would personally carry out in front of the class.

You may format any of this how you wish. However, it should be typed, be free of errors, and look professional.

3 How you will be assessed

You will be assessed on the following:

- Correct spelling/grammar.
- The overall professional style.
- The extent to which your lesson plan covers the required material.
- The extent to which you justify your various choices made in the *overall description*.

In more detail:

An *excellent* lesson plan will be one that...

A *good* lesson plan will be one that...

A *poor* lesson plan will be one that...

4 Your specific math topic

Option 1:

You will teach your students about *ellipses*. Specifically, you need to discuss at least two of the following three definitions of an ellipse:

- An ellipse is the set of points p in the plane such that the sum of the distance from p to each of two fixed focal points f_1, f_2 remains fixed.
- An ellipse is the set of points (x, y) in the plane that satisfy

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

- An ellipse is the intersection of a cone in \mathbb{R}^3 with a plane, provided the intersection is a bounded set.

You should address the sense in which these definitions are equivalent. Finally, you are required to cover the following supplemental concepts:

- the semi-minor axis
- the semi-major axis
- graphing in basic situations
- lines of symmetry.

If you wish, you may cover other topics as well. For example, you could cover *eccentricity, the directrix, planetary motion, area formulas, parametrization, ellipses not centered at the origin, ellipses with axes not parallel to the coordinate axes,* or anything else you find interesting/appropriate.

Option 2:

You will teach your students about *hyperbolas*. Specifically, you need to discuss at least two of the following three definitions of a hyperbola:

- A hyperbola is the set of points p in the plane such that the difference of the distance from p to each of two fixed focal points f_1, f_2 remains fixed.
- A hyperbola is the set of points (x, y) in the plane that satisfy

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1.$$

- A hyperbola is the intersection of a double cone in \mathbb{R}^3 with a plane, provided the plane intersects both cones.

You should address the sense in which these definitions are equivalent. Finally, you are required to cover the following supplemental concepts:

- asymptotes
- graphing in basic situations
- lines of symmetry.

If you wish, you may cover other topics as well. For example, you could cover *eccentricity, the directrix, the graph of $1/x$, parametrization, hyperbolas not centered at the origin, hyperbolas with axes not parallel to the coordinate axes*, or anything else you find interesting/appropriate.