Instructor Notes for Chapters 9, 10,11

Section 9.1 Systems of Equations in Two Variables

Goal for students:

- *Solve a system of equations graphically;*
- *Solve a system of equations algebraically by substitution and elimination;*
- *Set up and solve application problems that involve systems of linear equations*

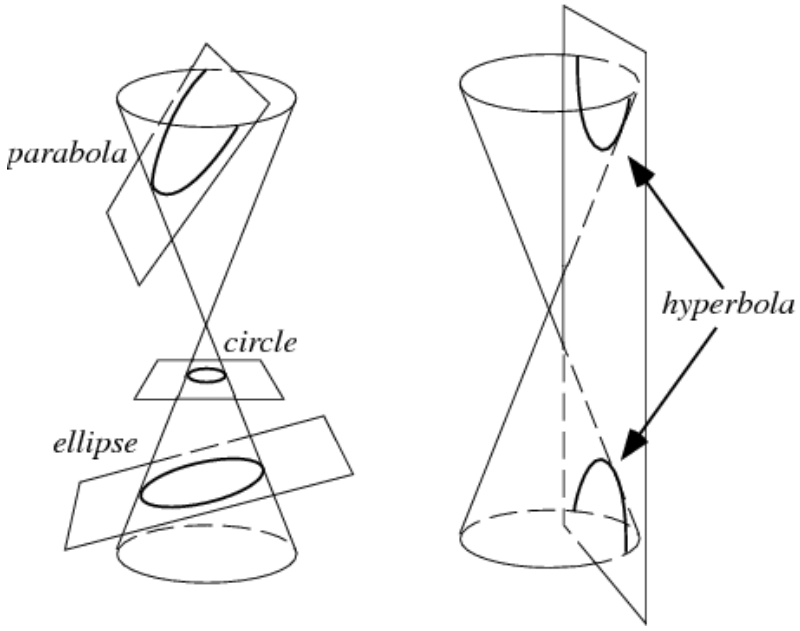
This section is a review for our students. You might focus the first half of class on setting up problems involving systems. One way to discuss this topic is to give students a problem like #57 on p. 752 to set up in small groups, then discuss it. Then let them set up several more, perhaps #58, #62, #64.

A review of the methods of solving is then in order. Start simple. You might do #1 – 6 p. 750 orally together.

Suggested HW: **MLP HW 9.1**

****

In Chapter 10, we study the conic sections. Be sure to mention why we call these curves conic sections and refer them to the pic on page 832 in the text or use this one:



The conic sections have a very interesting history, and were discovered while attempting to solve one of the three famous unsolvable problems from ancient mathematics: doubling the cube. Today, as the students will see, they have several interesting applications. You might look here for computer simulations for a classroom demonstration OR group activity. You need the Geometer's Sketchpad (GSP) software in order to run the simulation. The university has a campus-wide license, so if you do not have this software on your office computer, feel free to ask Jason Rozen (rozen@math.kent.edu) to install it. Enjoy!

Section 1.1 and 10.1 Distance Formula and Parabolas

Goals for students:

- Derive and use the distance formula
- Identify an equation determining a parabola
- Given an equation of a parabola, complete the square if necessary, then name the vertex, the focus, and the directrix.
- Given an equation of a parabola, accurately sketch it by hand.
- Solve applied problems using parabolas

You'll need to derive the distance formula with students. This material is from section 1.1, but not really used until now. You might motivate the distance formula by presenting this problem:

> *The quarterback of the KSU football team throws a pass from the KSU 30 yard line. He is 10 yards in from the sideline and his receiver catches the ball right on the sideline at the opponent's 46 yard line. How far did he throw the pass?*

Let students figure it out first if they can (time permitting) and use their ideas as you work through it. Be sure they understand that the distance formula derives directly from the Pythagorean Theorem. You'll need then to do several routine examples.

Once students feel comfortable with the distance formula (most will have seen it before), derive the standard equation of a parabola with vertex at the origin. Identify the vertex, focus, and directrix. You might then do #1 – 6 on p. 838 orally together. Follow with several examples of equations for which you need to complete the square.
Time permitting, you might do one application….these are cool….or let students figure it out for themselves on the homework.

Suggested HW: **MLP HW 10.1**

Section 10.2 The Circle and the Ellipse

Goals for students:

- Identify an equation determining a circle
- Identify an equation determining an ellipse
- Given an equation of a circle, complete the square if necessary, then name center and radius.
- Given an equation of a circle, accurately hand-sketch its graph.
- Given an equation of an ellipse, complete the square if necessary, then name the center, the vertices, and the foci.
- Given an equation of an ellipse, accurately sketch it by hand.
- Solve applied problems using circles and ellipses

Ask students to derive the standard equation for a circle in small groups, then discuss. Be sure to define all terms – including circle, center, radius, though most of these will be familiar to students. Follow with a few

examples of completing the square, which will probably not be too difficult now for your students. Ex #1-6 on p. 848 are good to do orally, as are (eventually) #19-22.

You then might pose the question: *What do you think would be the shape of a figure which is the set of all points the **sum of whose distances** from **two fixed points** is a constant?* Students can explore this notion with a piece of yarn or string and making a sketch as suggested on p. 842.

Then derive the standard equation of ellipse, carefully defining terms and graphing by hand. Students will be used to completing the square by now, so you might ask them to try one, working with a partner (at the chalkboard?) and sketching its graph.

The ellipse has some nice applications. As an introduction, you might inquire if any of your students have visited a Whispering Gallery. There is one in the Capitol Building in Washington DC and one in Columbus OH at the COSI museum. Another application is, of course, the motion of the planets in our solar system.

Suggested HW: **MLP HW 10.2**

Section 10.3 The Hyperbola

Goals for students:

- Identify an equation determining a hyperbola
- Given an equation of a hyperbola, complete the square if necessary, then name the center, the vertices, and the foci.
- Given an equation of a hyperbola, accurately sketch it by hand.
- Solve applied problems involving hyperbolas.

As a small group activity, you might ask students to derive the equation of a graph consisting of the set of points whose difference (in absolute value) of the distance from two fixed points is constant. Then do as you did with the other conic sections – carefully define terms, identify center, vertices, foci, and make accurate hand sketch. Then complete the square. You might do exercises #1 – 6 on p. 859 orally together in class.

Suggested HW: **MLP HW 10.3**

Section 11.1 Sequences and Series

Goals for students:

- Find terms of a sequence given n^{th} term
- Look for a pattern in a sequence and determine a general term
- Convert between sigma notation and other notation for a series.

Suggested HW: **MLP HW 11.1**

Section 11.2 Arithmetic Sequences and Series

Goals for students:

- Find the n^{th} term when n is given and n when the n^{th} term is given.
- Given two terms, find the common difference and construct the sequence.
- Find the sum of the first n terms of an arithmetic sequence.

Suggested HW: **MLP HW 11.2**

Section 11.3 Geometric Sequences and Series

Goals for students:

- Identify the common ratio of a geometric sequence and find a given term and the sum of the first n terms.
- Find the sum of an infinite geometric series, if it exits.

Suggested HW: **MLP HW 11.3**

Exam Ch 9, 10, 11

There is a set of review problems and a practice exam on MML for the Exam.

All in-class exams are paper and pencil exams and a sample is available for you. Please see Bev for access.