Chapter 3 Suggestions
Also includes Sec. 2.4 and Sec. 4.1

Lab Days:
First week: Falling Object lab -- see instructor site for details. The student pages are on their *Blackboard* site.
Second and third weeks: Regular class days

Section 2.4 Solutions of Linear Inequalities

Goals for students:
- Correctly solve linear and double inequalities algebraically and express the solution using interval notation
- Correctly solve a linear inequality graphically and express the answer using interval notation

Start by having students work on p. 71 in the Handbook in small groups. Then let them come to the board and discuss their work. I'll do a few applications (p. 147 # 32, 34, 36) and then a few skill problems from p. 146: #8, 10, 18, 22, 24. Interesting the way the author splits apart the double inequalities. Good opportunity to discuss the difference between the conjunctions "and" & "or" and their uses in mathematics.

Suggested Homework: MML HW 2.4

Section 3.4 Quadratic and Power Models

Goals for students:
- Use second differences to determine if data set is quadratic
- Use the quadratic regression feature on the calculator to create a quadratic function for a given data set
- Interpret in context various points on a quadratic model

Though our author uses power models in this section in addition to quadratic, our focus is on quadratic models. This section is an introduction to models other than linear and relies heavily on the regression feature of the graphing calculator. You might begin by asking students to explore a data set (like that in Table 3.14 on p. 218) and determine if the data is linear. Then encourage them to take second differences. Enter the data in your calculator and note the shape of the graph. Continue, then, with several other examples, perhaps by typing in a quadratic function in your TI calculator and showing students the table. Then discuss some in context, like Example 4 on p. 216 or #26 on p. 225, following up with a demo about quadratic regression on the calculator.

Suggested Homework: MML HW 3.4

Section 3.1 Quadratic Functions: Parabolas

Goals for students:

- Given a quadratic function, determine if its graph is concave up or concave down and also determine if the vertex of its graph is a maximum or a minimum point.
- Given a quadratic function, name the coordinates of the vertex of its graph
- Find and interpret the vertex of a quadratic function in context

You might begin by asking students to sketch several rectangles that can be made given 60 yards of fencing. You might make a table at the chalkboard (like that on p. 76 in the handbook), listing various lengths, then corresponding widths and areas. Ask students to sketch a graph of the area as a function of its length. *What is the largest possible area? Which point on the graph indicates this area? Interpret this point in words.*

How can we find this maximum point? Harshbarger & Yocco have an intuitive way deriving the vertex formula on p. 171, though you might consider using a concrete function (like $f(x) = 30x - x^2$). The example on p. 77 in the handbook is a good follow-up as are those on the pages following (pp. 78-82).

Suggested Homework: MML HW 3.1

EXTRA DAY FOR MODELING

This day is not in the syllabus, but I plan to take it anyway, since writing quadratic models is an important and doable skill for our students.

Goals for students:

- Given sufficient information, write a quadratic model for a real world scenario, including perimeter-area and revenue problems.

You might start with the problem on p. 83 in the handbook:
What is different about this problem? What would the total revenue be? What would the total profit be?
Then find and interpret the maximum value.

I plan to then work through a couple examples like those on p. 85 in the handbook, then let students work in groups on the rest of them. Hint to students: *Make a sketch!*

Suggested homework: Finish p. 85 in handbook; in text: p. 182: #73, 74

Section 3.2 Solving Quadratic Equations **(2 days)**

Day 1 Goals for students:

- Solve a quadratic equation by factoring
- Solve a quadratic by completing the square
- Solve a quadratic by the square root method
- Solve a quadratic by using the quadratic formula

Students should be relatively proficient with factoring, since we reviewed this skill at the beginning of the semester.
You might use this first day as a skill day, reviewing the methods above for solving a quadratic. Our students need NOT be held responsible for deriving the quadratic formula, but showing it to them is probably a good idea if you have time.
Review simplifying with radicals.
Remind students that the handbook has numerous worked examples on pp. 90-92.

Suggested homework: in handbook: p. 93: the circled problems

Day 2
Goals for students:

- Use the technique of factoring to solve a quadratic in context
- Use the quadratic formula to solve a quadratic in context
- Understand the connection between the discriminant of a quadratic, the *x*-intercepts of the graph, and the solutions of the equation

Most of the word problems in this section are solvable by factoring or extraction of roots. Problems 59 and 60 on p. 197 though, might be more easily solved by using the quadratic formula even though the solutions are integers. Problems 61ff suggest a graphical approach…rather interesting.
Time permitting, discuss the discriminant and how it affects the graph of a quadratic function. In particular, students should recognize that a parabola with no *x*-intercepts has no real solutions. Complex numbers are not in our curriculum. Do be careful to say "If the discriminant is less than 0, there are no ***REAL*** solutions," rather than saying, "….there are NO solutions."

Suggested Homework:* *MML HW 3.2

Sec. 4.1: Transformations of Graphs and Symmetry **(2 days)**

Day 1
Goals for students:

- Graph by hand a simple graph of cubic, square root, absolute value, and reciprocal functions.
- By hand, make a sketch of a quadratic function or any of the above mentioned functions using vertical or horizontal translations
- Given a graph of a transformed function (vertically or horizontally), write its function rule

You might begin by asking students to graph by hand each of the functions mentioned in the first bullet above. You could have a couple students at the board doing this. Be sure they have a good grasp of what these "parent" functions look like. The handbook (p. 98) is a good reference for these parent functions. You might ask them to memorize the basic shapes and give them a quick quiz tomorrow.
The activity sheets on pp. 99-104 in the handbook are ideal for having students discover the vertical and horizontal shifts using their graphing calculators. Students can work in groups on these. Time permitting, allow students to come to the front, use the viewscreen, and explain their discoveries.

Suggested Homework:* *MML HW 4.1 **AND in Handbook: p. 110: #9-11 and on p. 111: #2, 4, 6**

Day 2

Goals for students:

- By hand, make a sketch of a quadratic function or any of the above mentioned functions using vertical stretches and compressions
- Given a graph of a transformed function (with vertical stretches or compressions), write its function rule
- Interpret translations in context

Using translations in context is something new for us and rather interesting.

Suggested Homework: MML 4.1 B AND in Handbook: p. 10: # 9 – 11 and on p. 111: #2, 4, 6

Sec. 3.3 Piecewise Functions Day 1

Goals for students

- Understand the need for piecewise functions in certain contexts
- Find function values given a piecewise function
- Sketch a graph of a piecewise function given a real-world scenario
- Write a function rule for a piecewise function given a real-world scenario

For this first day, you might have students working in groups on the activities on pp. 123-126 in the Handbook. You might use the "earthworm activity" as an introduction. This problem presents a nice introduction to piecewise functions. When most students are finished with this piece, we usually discuss it, thus bring to the surface some significant issues with piecewise functions: evaluating them, using function notation, and domain restrictions.

Then I plan to simply let students work on the other activities, discussing them as the need arises. (These are in the handbook on pp. 123-126 and also still attached to the earthworm sheet….sorry.) This will probably take most of the time. When most students are finished, you might have them come to the board and sketch their graphs and write their formula. OR you might make an overhead transparency of the grids, thus facilitating a meaningful discussion as one student works on the overhead and others clearly see what s/he's doing.

Suggested homework: Finish the Activity Sheets on pp. 123-26 in the handbook

Sec. 3.3. Piecewise Functions Day 2

Goals for students:

- Given the graph of a piecewise linear function, student can write its function rule
- Given the rule for a piecewise linear function, student can sketch it
- Given a real-world scenario using a piecewise function, student can write the function, evaluate it at given values, and interpret the meaning

The focus today is on graphing piecewise functions and writing a function rule given its graph. Ideally, we'd like students to be able to write a piecewise function for a real world scenario, but our book simply does not demand that of students, so we'll have to skim over that part.

Our book is weak on exercises here, so there's yet another piecewise function practice sheet in the handbook on p. 130.

Suggested Homework: MML HW 3.3 AND in Handbook: p. 130: odds

THERE'S A PRACTICE EXAM FOR STUDENTS ON MLP AND A SAMPLE EXAM FOR YOUR USE ON THE INSTRUCTOR WEBSITE. Please be sure to (at least) change the numbers a bit.