Chapter 6 (with 4.4) Suggestions

Section 6.2 Modeling Cubic and Quartic Functions

- Recognize a cubic or quartic data set by using third or fourth differences
- Use the regression feature of the graphing calculator to create cubic and quartic models
- Recognize, by using a scatterplot, data that can be modeled by a cubic or quartic function
- Find an interpret function values of cubic and quartic functions in context

You might begin by given a data set that is cubic and ask students to figure out what type of function would best model this data; linear? Quadratic? Cubic? This is a good time to review the techniques for determining this information.

Review the regression feature on the calculator, then you might work through problems 24 and 22 on pp. 440 and 439, taking care to interpret the function values.

Suggested Homework: ***MML:*** HW 6.2.

Section 6.1 Day 1: *(During fall semester, you may not have two days. Try to do a few word problems on Day 1 as well as what is indicated here.)*

Goals for students:

- Given a polynomial graph, determine whether it's degree is odd or even
- Given a polynomial graph, determine if the leading coefficient is positive or negative
- Given a polynomial function, determine the largest possible number of *x*-intercepts and turning points

You might let students work on the activities, "End Behavior of Polynomials Investigation" and "Even and Odd Multiplicity Investigation" on pp. 172-73 in the Handbook.

Suggested Homework: ***Handbook:*** p. 175 Odd problems

Section 6.1 Day 2: *(During fall semester, you may not have this second day. Try to do a few word problems on Day 1)*

Goals for students:

- Choose a viewing window on the graphing calculator that gives a complete graph of a given polynomial
- Interpret function values of polynomial functions in context

After reviewing hw problems, you might do (or let students do in groups) #2 ands #4 on p. 424. Discuss the importance of knowing the general shape of a polynomial even when using technology so that one can discern if the given graph is complete. You might do a few from the word problem section as well, perhaps #38 and #40 on p. 427.

Suggested Homework: ***MML:*** HW 6.1

***Section 6.3* Solutions of Polynomial Equations**

Goals for students:

- Find zeros of a polynomial function using factoring by grouping
- Solve a polynomial equation using factoring by grouping
- Understand the relationship between zeros of a function, solution to the equation $f(x) = 0$ and the *x*-intercepts of the graph of the function.
- Solve polynomial equations in context.
- Write a model for volume of a cube.

There's a lot going on in this section.

One engaging way of introducing the need for solving polynomial equations and writing models is the volume problem, example 2 on p. 445. You might bring square pieces of paper to class (one for each student), some scissors, and ask students to make a rectangular "popcorn" box that would hold the most popcorn.
After several minutes, discuss results and together write a model for the volume of the box. Students can use their calculators to find the max volume. You might want to advertise calculus at this point….Algebra does not allow us to find this exact solution; we need calc to do so. ☺
You might take some time to interpret what the zeros of this function mean in context.

Do a few factoring by grouping "skill" examples and maybe #42 on p. 453. That's probably all you'll have time for.

Suggested Homework: ***MML:*** HW 6.3

***Section 6.4* Polynomial Equations Continued; Fundamental Theorem of Algebra**

Students can

- Perform long division of polynomials
- Divide polynomials using synthetic division, when appropriate
- Determine whether a given constant is a solution to a given polynomial equation using synthetic division.
- Given one solution to a polynomial equation, find the others using synthetic division
- Solve polynomial equations in context using synthetic division and factoring.

The focus today is on the skills of long division and synthetic division. Be sure students understand that when the remainder is zero, the divisor is a factor of the polynomial and vice versa.

Suggested Homework: ***MML***: Begin HW 6.4; Complete Handbook p. 187-88 odds

Section 6.4 Day 2:

Goals for students:

- Given a polynomial, name the possible rational zeros
- Given a polynomial, find all the real zeroes using the rational zero test, synthetic division, and factoring.

You might consider using this approach to the rational zero test, stressing reasoning, rather then memorization:

You might begin be recalling the process of factoring a quadratic such as $f(x) = x^2 - x - 6$.

- *How do you find the factors?*
- *In the factored form* $(x-a)(x-b)$*, what does the product* ab *=?*

Similarly for other easy quadratics such as $f(x) = x^2 - 2x - 15$, $f(x) = x^2 - 7x + 10$

Then you might ask them

In the polynomial $f(x) = x^4 + 5x^3 - 27x^2 + 31x - 10$*, how many (linear) factors do you think there would be?*

Then I'd write $(x-?)(x-??)(x-???)(x-????)$.

What does the product of all the ?????????? have to be?
So what are the possible rational zeros?

Similar questioning, then, with a polynomial with a leading coefficient not equal to 1, such as:

$f(x) = 3x^4 - 4x^3 + x^2 + 6x - 2$ which would factor into the form:

$(ax-?)(bx-??)(cx-???)(dx-????)$

How many linear factors (at most) would there be?
What does the product ?????????? have to be?
What are possible values for a, b, c, d?
How does this affect the zeros? How do you find a zero once you know a factor?

Then state the Rational Zeros Theorem.

Pull everything together then and summarize the steps for finding zeros of a polynomial:

1. Use the Rational Zeros Theorem to list possible rational zeros
2. Use your graphing calculator to help narrow down the choices
3. Use synthetic division to find the zeros and list factored formula

You might do an application problem, time permitting.

Suggested Homework: ***MML:*** Finish HW 6.4; Complete Handbook: pp. 189-90: 7 – 13 odd

Section 4.4 Additional Equations and Inequalities

Goals for students:

- Solve a quadratic inequality graphically
- Solve a quadratic inequality using a sign chart
- Solve a quadratic inequality in context

This seems like a logical place to do quadratic inequalities with our students…a logical lead-in to the polynomial inequalities of section 6.6

You might motivate the skill by referring to problem #46 on p. 299, then #44, etc. Factoring out the leading coefficient seems to be a good strategy with the application problems. Introducing a graphical solution as one method is good, but please also insist that students solve by using a sign chart.
The handbook has excellent step by step solutions on pp. 191ff.

Suggested Homework: ***MML:*** 4.4

Section 6.6 Polynomial and Rational Inequalities

Goals for students:

- Solve a polynomial inequality graphically
- Solve a polynomial inequality using a sign chart
- Solve a polynomial inequality graphically
- Solve a rational inequality graphically

Today's topic is a natural extension from yesterday's. After reviewing yesterday's homework, you might ask students to work in groups on #5, 16, 21, 23 on pp. 483-84 and let them figure it out for themselves. Then ask a group to show the class what they did.

Be sure to insist that students solve these both graphically and with a sign chart.

Suggested Homework: ***MML*** ***Paper and Pencil***