March 4:
Graphing
Quadratic
polynomials

John T.
Baldwin

March 4: Graphing Quadratic polynomials

John T. Baldwin

March 10, 2009

Next Quarter

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The class next quarter will be on 10 Monday nights same time (5:00 PM -8:15 PM) same place (Munroe School)
starting Monday, March 30 and ending Monday, June 8. Class will not be held on Memorial Day, Monday, May 25 or Monday April 6.

Today

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Graphing
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1. inequalities in two variables
2. 'conjugates' and rational/real coefficients
3. Yao and what is 'solving an equation'
4. Harel and 'guess, check, and generalize'
5. minimax problems
6. evaluations
7. questions
8. exam discussion

1. Solve the following system inequalities graphically using your graphing calculator and turn in a sketch of the graph with the region satisfying the inequalities shaded.

$$\begin{aligned} y &> 7x^2 \\ |x| &< y \end{aligned}$$

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1. What sort of object is the solution?
2. How can it be described? What are the intersection points?
3. calculator screen size; use z-box

Difference of Squares - conjugates

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CME 665: 12, 13
Extend to i. Return to 664: 10, 11

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Ask someone to explain the correct solution to CME 664
numbers 10-11.

Yao

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Consider the following argument.

Let H be your height, Y be Yao's height and A be the average of the two heights, $(H + Y)/2$. Then $H + Y = 2A$ so that:

$$(H + Y)(H - Y) = 2A(H - Y) \text{ or}$$
$$H^2 - Y^2 = 2AH - 2AY \text{ or}$$
$$H^2 - 2AH = Y^2 - 2AY$$

or, adding A^2 to both sides of the equation

$$H^2 - 2AH + A^2 = Y^2 - 2AY + A^2$$
$$(H - A)^2 = (Y - A)^2.$$

Thus, $H - A = Y - A$ or $H = Y$. You are indeed as tall as Yao! If you do not think you can ever be as tall as Yao, find the flaw in this argument.

What is a written solution of an equation/inequality

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What is a written solution of an equation/inequality

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It is a series of deductions about any number(s) that might satisfy the

1. equation
2. inequality
3. system of equations
4. system of inequalities

Moral

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If the solution is correct, each line implies the next.
In the case of Yao, the conclusion that if two numbers have the
same square they are equal was incorrect.
In other cases, (next quarter), the implication may be correct
but The two statements may not be equivalent.
So the result is a candidate solution.
Any solution will satisfy the last line.
Not every number that satisfies the last line has to be a
solution.

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See handout. Taken from Harel's DNR as a conceptual framework.

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CME 710 problem 8

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CME 710 problem 8

Look at problem 10 on that page.

Maximizing area

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CME 710 problem 8

Look at problem 10 on that page.

Make up a similar but more complicated problem where there are different constraints on the perimeter (including internal walls) but the area is maximized.

Course Summary for Exam

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Each topic may be addressed either in a concrete situation or as pure mathematics problem.

1. Solution of systems of linear equations.
2. Graphs of linear equations
3. modeling
4. What does it mean to have no or infinitely many solutions
5. Solution of systems of linear inequalities (in one unknown)
6. Solution of systems of linear inequalities (in two unknowns)
7. absolute value including solutions of inequalities and equations in one or two variables
8. Finding exact solutions; finding approximate solutions graphically
9. Normal forms for linear and quadratic equations

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10. Properties of quadratic functions and their graphs
11. Solutions of quadratic equations (factoring, completing the square, quadratic formula)
12. representing functions by formulas, graph, table
13. Transformation of quadratics and the effect on the graph
14. understanding the logic of equation/inequality solutions
15. the zero product property and other properties of the real numbers
16. minimizing or maximizing quadratic functions
17. the function notion

Find at least one problem from the homework or from the CME text that addresses each of these topics and solve it. Some of the topics are broad enough so that you should look at several different problems. Look for connections between the various topics. Try to see how the same concrete situation can be solved using different topics.