Feb. 2.
Absolute
values and
Functions

John T.
Baldwin

Functions

Homework
from an
advanced
standpoint

Feb. 2. Absolute values and Functions

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February 2, 2009

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Feb 2: Overview

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1. graphing distance versus time
2. absolute value
3. Homework from an Advanced Standpoint
   1. Rethinking rules
   2. Formulas, Equations and functions
4. Cartoon and KK reading
5. Matters arising

Concept before Name

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George goes for a walk in the park. The y-coordinate denote
the distance along the path from his starting place that he has
reached at time t.

Tell a story to explain this graph (on handout).

Is this the graph of a function. If so, what is the rule?

Concept before Name

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George goes for a walk in the park. The y-coordinate denote the distance along the path from his starting place that he has reached at time t.

Tell a story to explain this graph (on handout).

Is this the graph of a function. If so, what is the rule?

Piece-wise definable functions

A function is piecewise definable if we write a different formula for each of several intervals to define the function.

Ahren's Axiom

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Introduce the concept and help students understand it before giving a name.

Now consider the first two problems on the worksheet about trips to Urbana.

Absolute Value

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The distance between two real numbers x and y is called the absolute value of $x - y$ and written:

$$|x - y|.$$

CME -202 Do problems on 202/203

Theorem 3.1

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Theorem

The absolute value of a number x is its distance from 0 on the number line.

Absolute value again

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$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

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What are the points whose distance from 3 is 5. (CME 204)

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What are the points whose distance from 3 is 5. (CME 204)

Graph on the number line the set of points whose distance from 3 is at most 5.

Absolute value in equations and inequalities

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What are the points whose distance from 3 is 5. (CME 204)

Graph on the number line the set of points whose distance from 3 is at most 5.

Solve the following inequality and graph the solution set on the number line.

$$|2x - 5| < 10$$

Hard Problem

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Solve the following inequality and graph the solution set on the number line. Do both intuitively, formally and with graphing calculator.

$$|.5x + 3.5| < 4$$

Systems of Inequalities

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Carefully sketch on the graph below the solution region to the following system of inequalities. Label each of the straight lines on your graph.

$$
\begin{array}{rcc}
2x - 3y & < & 3 \\
y & < & |2x - 5| \\
y & < & 5
\end{array}
$$

Hint: Graph, then solve exactly to find the points of intersection that you actually need.

Think about the question:
What is a rule?
as we look at the homework problems.

Handout

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hw 1a, 4 exact; in-out vrs out-in

Handout

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hw 1a, 4 exact; in-out vrs out-in

2a,$2^x - 1$ 2b, other rules

Handout

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3 geometric and algebraic solutions: at least three approaches

CME

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411-5, 422-2, 422-3;

RULES

What is a rule?

What is a rule?

When are two rules different?

What is a rule?

When are two rules different?

When are two rules really different?

Special functions

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Consider the CME 422: 2 and 3

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Consider the CME 422: 2 and 3

$y = 3$ or $f(x) = 3$ is a constant function.

Special functions

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Consider the CME 422: 2 and 3

$y = 3$ or $f(x) = 3$ is a constant function.

$y = x$ or $f(x) = x$ is the identity function.

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A function consists of a *domain* and a *rule*.
The rule assigns exactly one output to each member of the domain.

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What's the difference?

$$3x + 2 = 7x + 5$$

$$A = \pi r^2$$

Formulas vrs equations

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What's the difference?

$$3x + 2 = 7x + 5$$

$$A = \pi r^2$$

The second abbreviates

$$A(r) = \pi r^2.$$