

Question the Questions

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Defining Terms
Question₂: Any problem or question or command we might use in the math classroom

Defining Terms
Question₁: Reflect on the value, analyze intent, critique, think about how to make better

Examples from the Text Books

- Factor
- Simplify
- Solve
- Evaluate
- Expand
- Construct
- Isolate
- Prove

Sometimes well known book problems and procedures are designed to encourage students to avoid thinking about important mathematical ideas! This could be a bad thing.

A problem in a popular Pre Calculus text asks...

Tell whether the graph of each relation is the graph of a function.

The expected answer is

$$5\sqrt{3}$$

The expected answer is "no". Really?

Maybe the question should have been, "Complicate"

A problem in an Algebra 1 text asks...

Simplify

Problem 2 is

$$\sqrt{125}$$

Consider

A: $x^2 - x - 20$

and

B: $(x - 5)(x + 4)$

Questions – well considered questions – are absolutely essential to reveal deeper mathematical realities.

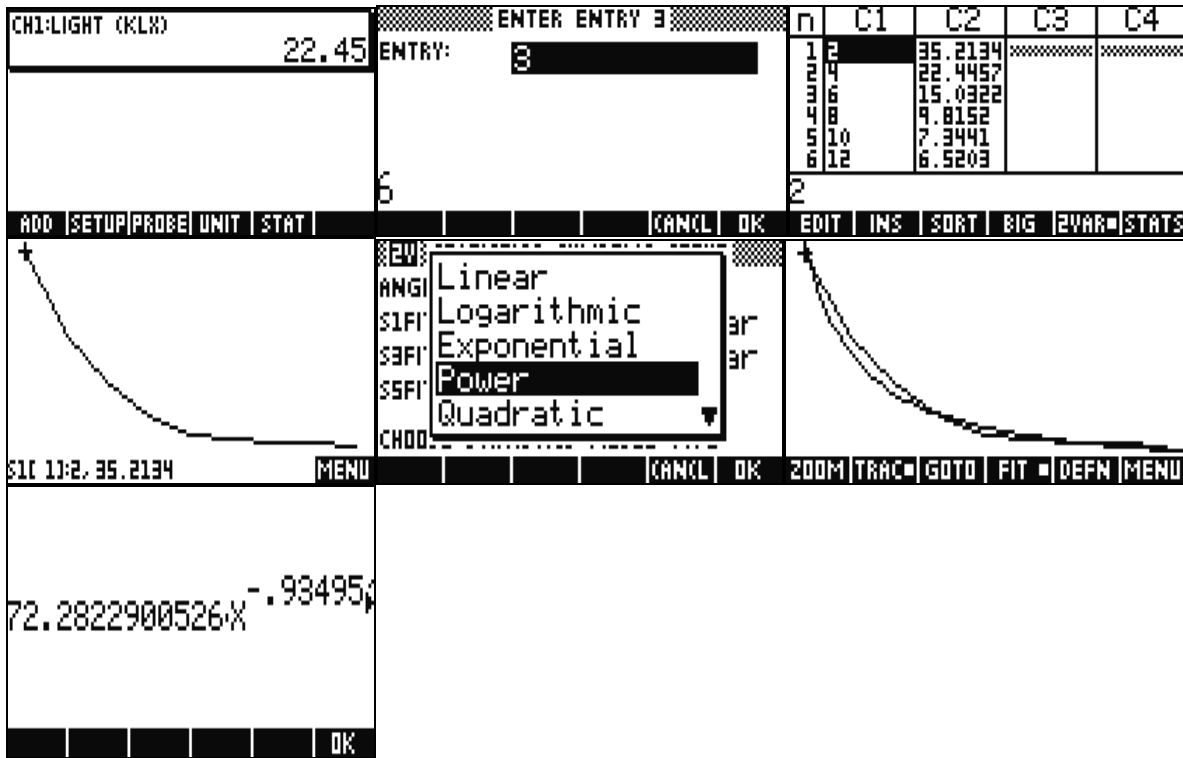
But it is very difficult to craft really good ones.

Three Activities

- Light Intensity
- Connecting the Midpoints of the Sides of a Quadrilateral
- A Problem from Calculus (Using New Graphing Technology)

Light Intensity

Capture intensity of light passing down a cylindrical tube



Light Intensity

- Idea of variable – middle school
- Is light intensity a function of distance?

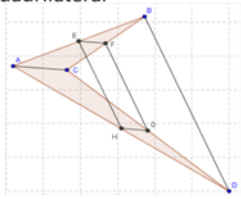
Light Intensity and the Nature of Inverse Variation

- What would happen to light intensity if you doubled the distance from the light source?
- How could you modify the activity to exhibit an inverse square law for light intensity?
- If you did, what would happen if you doubled the distance under those conditions?

Connecting the Midpoints of the Sides of a Quadrilateral

- Activity that can be a touchstone throughout the school year
- Proving a surprising result
- Students can use the proof to guide an investigation into special quadrilaterals

Connecting the Midpoints of the Sides of a Quadrilateral



Implicit Differentiation,
Differential Equations,
Factoring, and
Differentiability

If

$$4y^4 - 5x^2y^2 + x^4 = 0$$

find

$$\frac{dy}{dx}$$

So we wondered what the graph of our relation looked like...

Can you make up a relation with a linear piece and a quadratic piece so the line is tangent to the parabola?

What to Take Away

- Challenge book questions
- Try to make common book problems more interesting
- Take time, spend energy developing formative activities and questions

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Full talk available at

www.gonzaga.org
Academics, Mathematics,
Calculus AB, Mark Howell, Talks