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Being Right and Wrong in Different, Interesting Ways

Nolan Doyle

This presentation: http://bit.ly/nctmdoyle

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About Me

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Desmos Teaching Fellow

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$$4x(2x-9)-2(5x-6)$$

1. What work might you expect to see from your students?

2. What do you do next?

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My Favorite No

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My Favorite No: Learning From Mistakes

My Favorite No

- What is the role of the teacher?
- What is the role of the students?

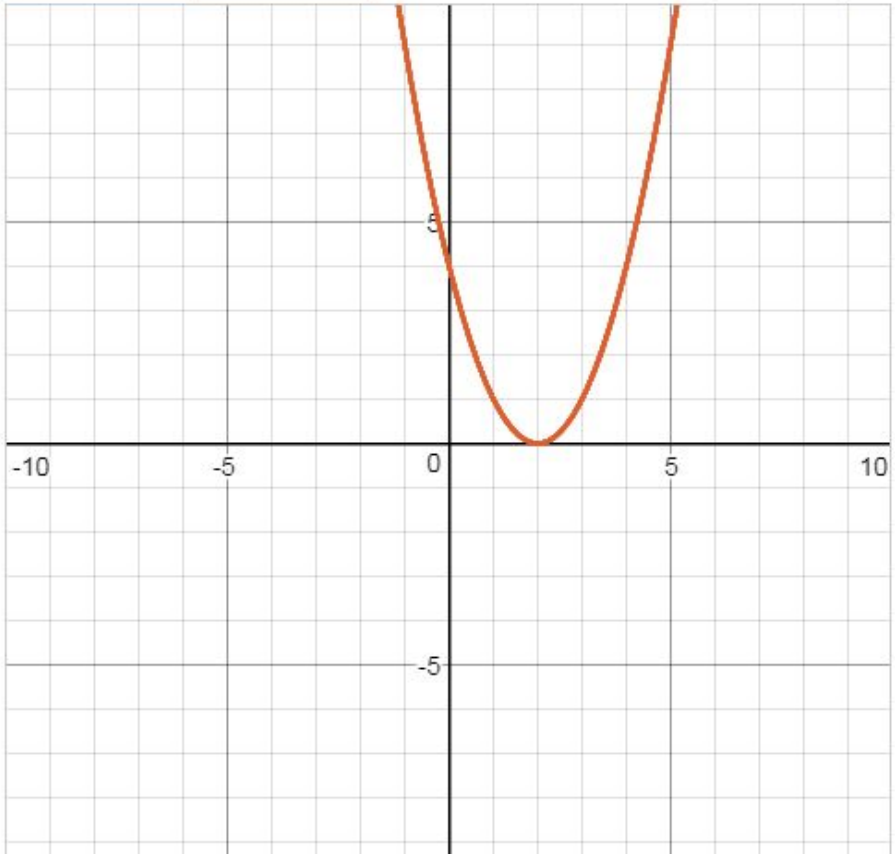
With Technology

- How can technology hinder this routine?
  - The most interesting mathematical thinking is still very difficult for a computer to assess
- How can technology improve this routine?

What do you notice about this graph?

Responses | Overlay

Show Original



Mary Jackson

it doesn't have 2 solutions

Jean Springer

does not go below the x axis

Liu Hui

there is only one solution

Alfred Tarski

it does not cross the x-axis

Bernhard Riemann

it is on the x axis

Hertha Ayrton

that it dosent go below the x axis

What is the RANGE of the relationship shown here?
Write your answer in algebraic notation.

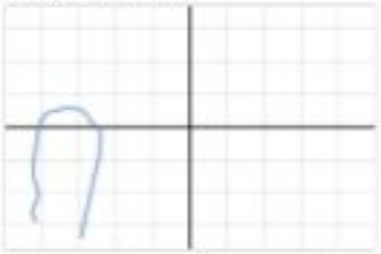
Expression	Students
$y > 1$	Godfrey Hardy, Julia Robinson, Augustin Cauchy, Atle Selberg, Hipparchus
$1 \leq y$	Michael Atiyah, Ernst Kummer
$\{1 < y\}$	Brahmagupta, Jean d'Alembert
$1 < y$	Diophantus
$y \geq 1$	Fan Chung
$\{y > 1\}$	Felix Klein
$\{y \geq 1\}$	Blaise Pascal

Screen 15 of 17

Responses | Overlay

Sketch a quadratic function that has (x+8) as one of its factors.

Mary Jackson



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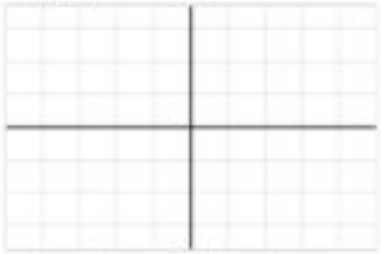
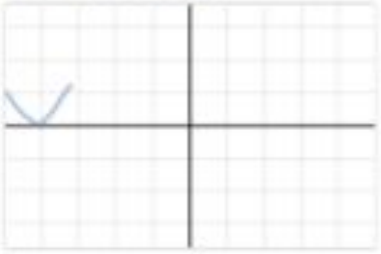
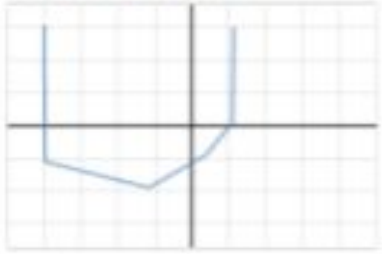


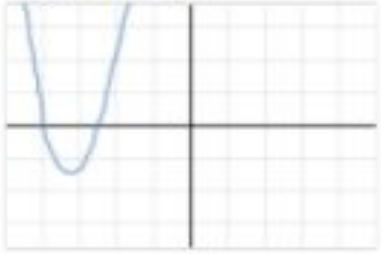
Karl Weierstrass



Elbert Frank Cox

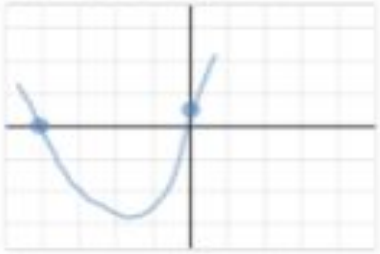


Hipparchus

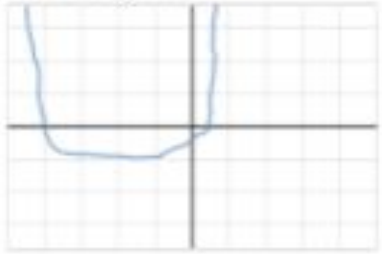


Alfred Tarski

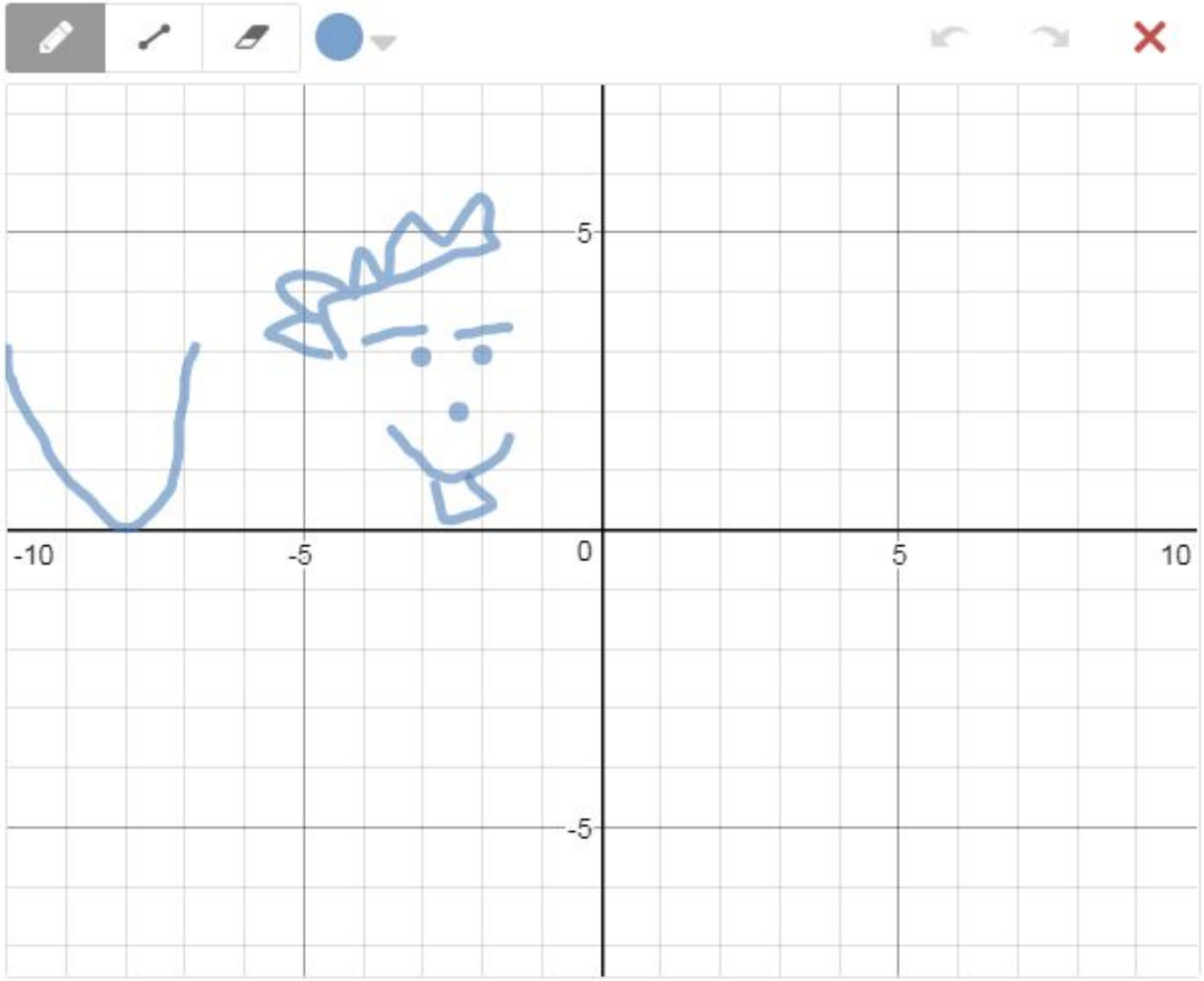
Bernhard Riemann



Hertha Ayrton



Sketch a quadratic function that has (x+8) as one of its factors.



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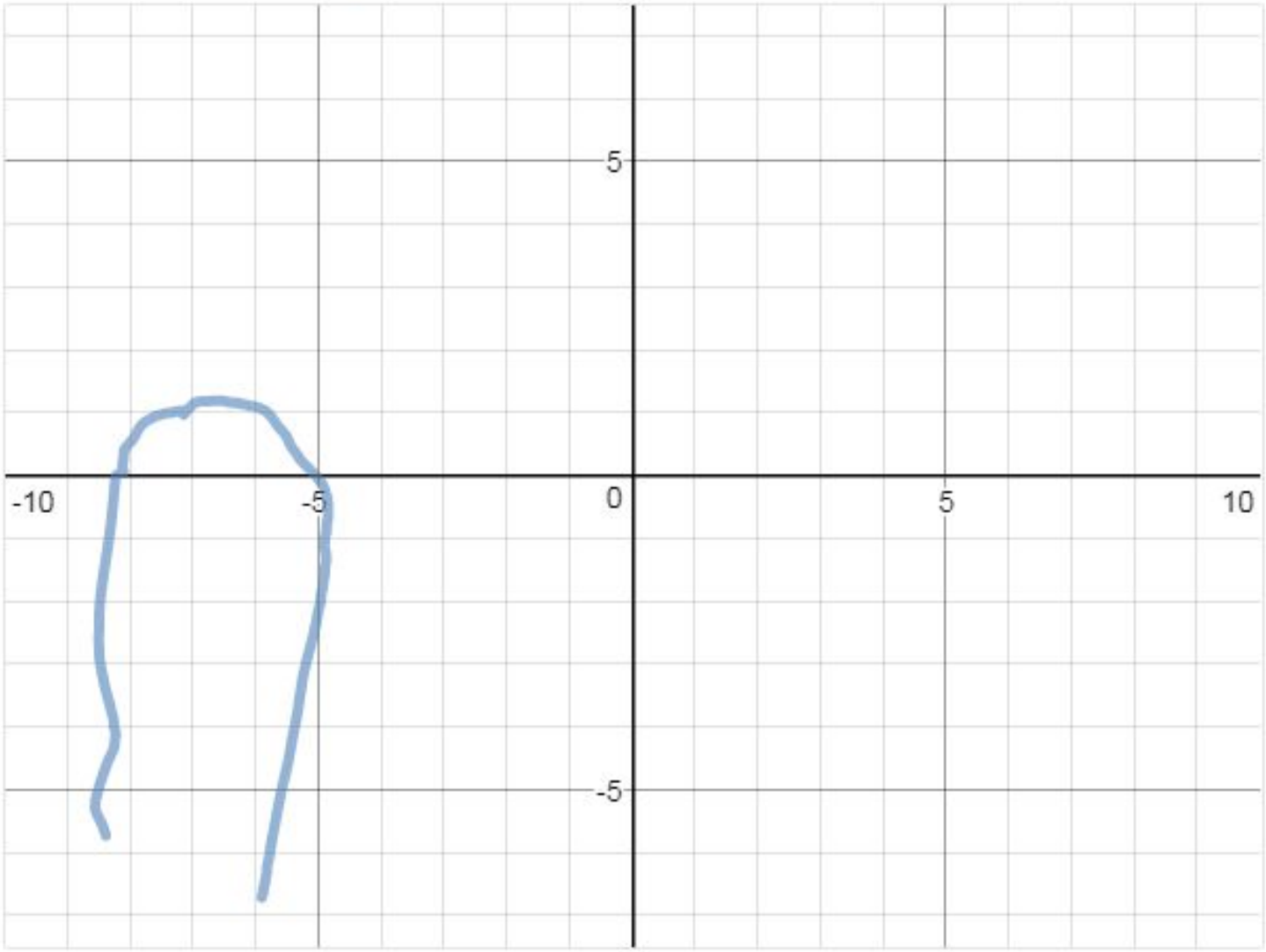
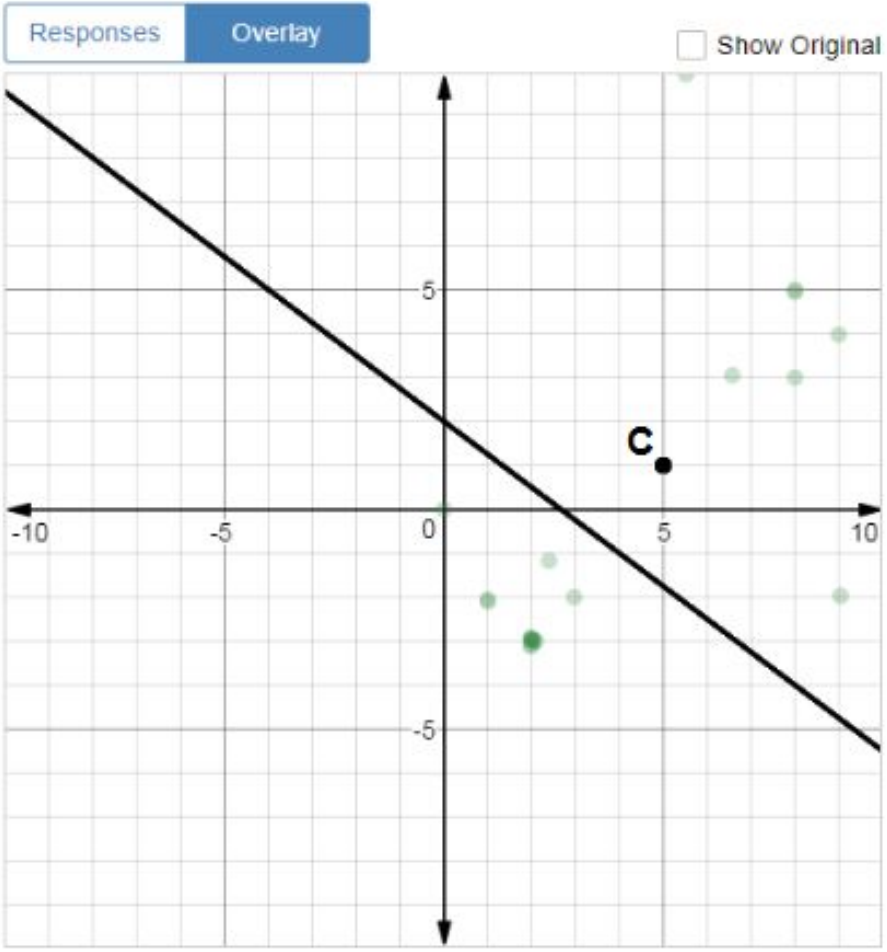


Find a point that is perpendicular to the given line.



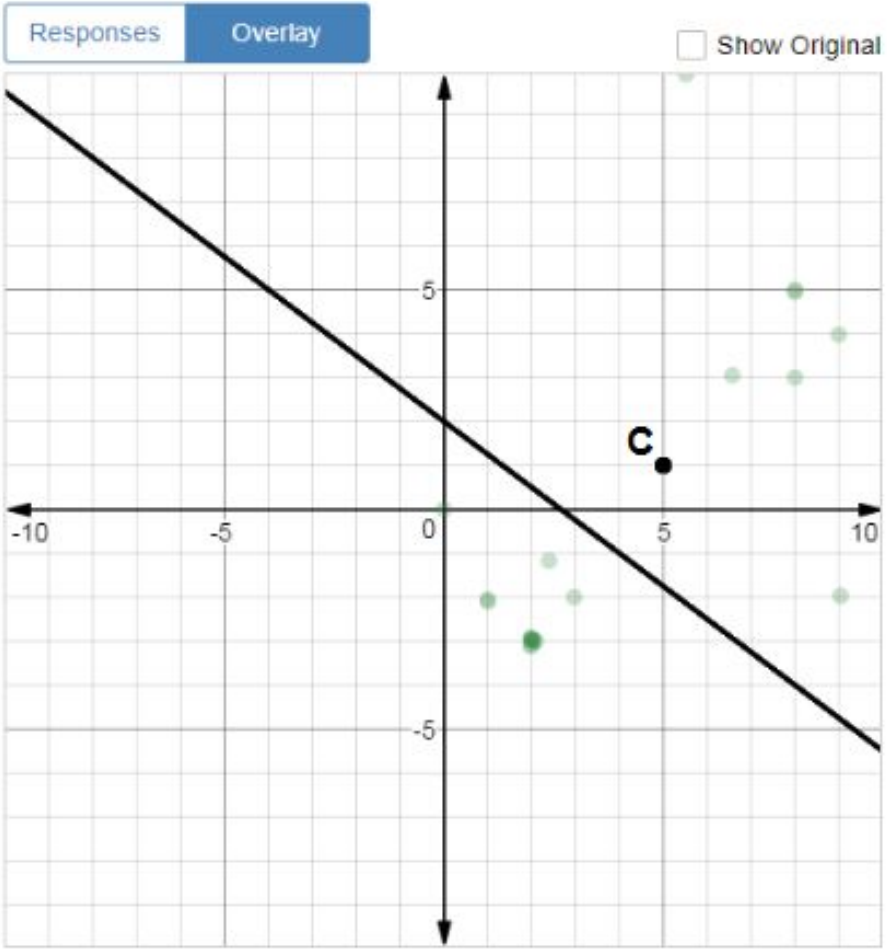
Find the coordinates of point D on the graph that lies on a line which passes through point C (5, 1) and is perpendicular to the given line. To answer this, move point D to the correct location AND type the coordinates of your answer in the answer box.

Marilyn Burns
@mburnsmath

Follow

A student's wrong answer is most often the right answer to a different but related question. (A quote from my undergraduate advisor, Bob Davis, that still serves me in the classroom.)

Find a point that is perpendicular to the given line.



Find the coordinates of point D on the graph that lies on a line which passes through point C (5, 1) and is perpendicular to the given line. To answer this, move point D to the correct location AND type the coordinates of your answer in the answer box.

My Favorite No

- What type of question was used?
- When would you use this routine?

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- What type of questions were used?

The Desmos Guide to Building Great (Digital) Math Activities

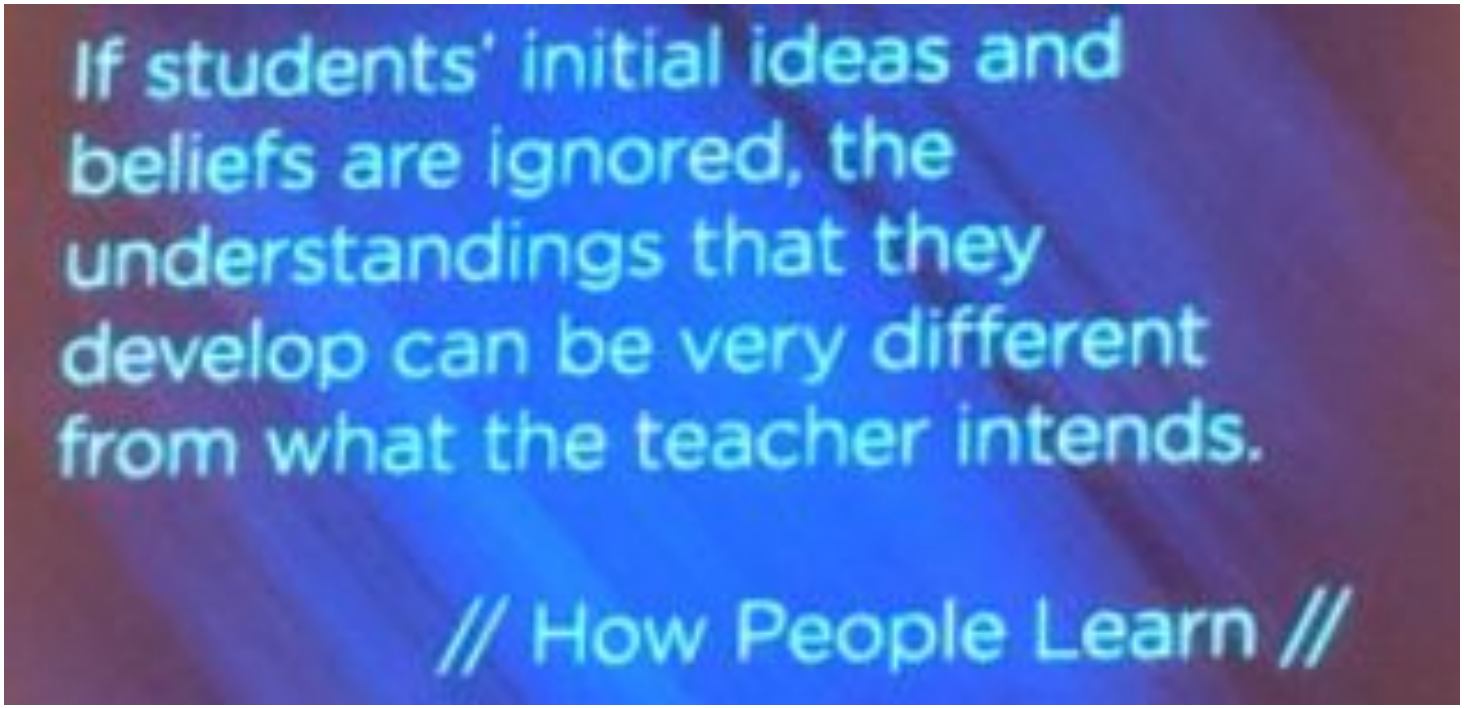
Ask for informal analysis before formal analysis.

Create activities that are easy to start and difficult to finish.

Create objects that promote mathematical conversations between teachers and students.

Connect representations.

Give students opportunities to be right and wrong in different, interesting ways.


If students' initial ideas and beliefs are ignored, the understandings that they develop can be very different from what the teacher intends.
// How People Learn //

Hey, students!

Go to student.desmos.com
and type in:

GFW XZJ

You can also share this link with your students:

https://student.desmos.com/?prepopulateCo

What happens to the circle on the graph if the value of "b" is positive?

HENRI LEBESGUE

If the value of "b" is positive, the circle moves to the negative side of the graph.

NINA BARI

If "b" is positive, the x-coordinate of the circle's origin becomes negative.

JOHANNES KEPLER

its midpoint has a negative "x" value

JOSEPH FOURIER

Its center point will be at a negative coordinate, but will still be on the x axis.

16 Pam thinks the equation of the circle on the graph is $4 = (x-3)^2 + (y-2)^2$.

Michael thinks the equation of the circle on the graph is $2 = (x-3)^2 + (y-2)^2$.

Who is correct?

Responses Histogram

Pam

22 students

Christiaan Huygens, Joan Bermin, Richard Dedekind, Johannes Kepler, Jacques Hadamard, Henri Lebesgue, Hermann Weyl, Ada Lovelace, Stefan Banach, Florence Nightengale, Évariste Galois, Nina Bari, Joseph Fourier, Olga Taussky-Todd, Herta Freitag, Sophus Lie, Elbert Frank Cox, Gaspard Monge, Pythagoras, Alice Schafer, Carl F. Gauss, Artur Avila

Michael

5 students

Johann Lambert, Aristotle, Ingrid Daubechies, Émilie du Châtelet, David Hilbert

Pam thinks the equation of the circle on the graph is $4 = (x-3)^2 + (y+2)^2$.

Michael thinks the equation of the circle on the graph is $2 = (x-3)^2 + (y+2)^2$.

Who is correct? Why?

Michael is correct because the radius is used to properly write out the equation and the radius of this circle is 2, not 4

Your graph from the previous slide is displayed to the left.

a. How did you get the radius to be 5?

I moved the a slider until the circle got as big as was indicated by the blue dots after having made my adjustments to the position of he circle.

JOHANN LAMBERT

I increased the value of "a" in order to get the radius to be 5.

GASPARD MONGE

To get the radius of 5, I made a 25 because r=sqrt(a)

ARISTOTLE

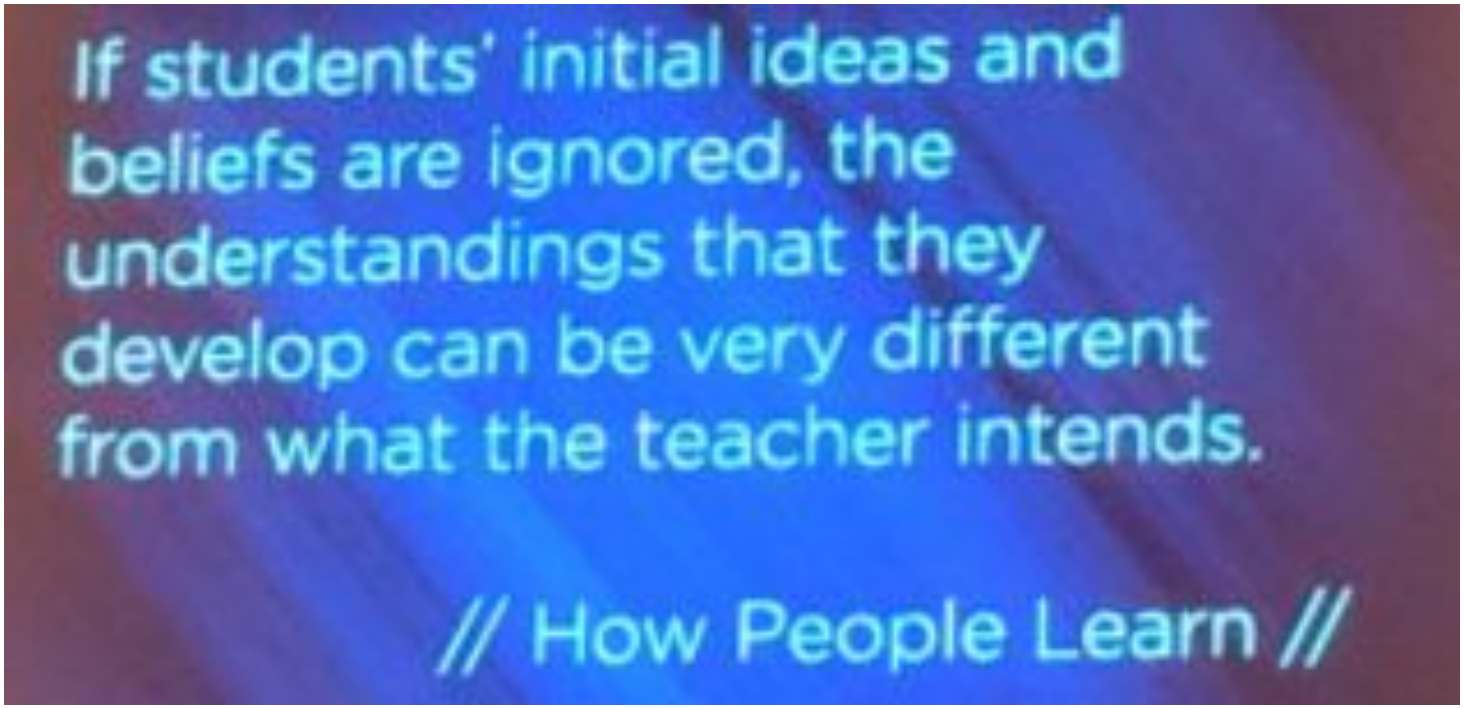
I made a = 25

With Technology

- The most interesting mathematical thinking is still very difficult for a computer to assess

Closing

- I do, We do, You do
- You do, We do, I do


If students' initial ideas and beliefs are ignored, the understandings that they develop can be very different from what the teacher intends.
// How People Learn //

Call To Action

- What can **YOU** do in **YOUR** classroom to give **YOUR** students opportunities to be right and wrong in different, interesting ways?

This presentation: http://bit.ly/nctmdoyle

Additional Resources: http://bit.ly/nctmdesmos

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Thank you for your time!

Nolan Doyle