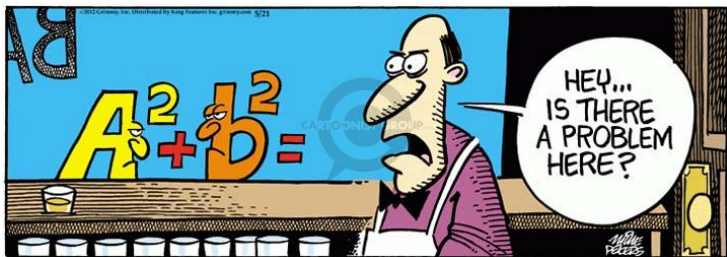


MAT 4040: Senior Capstone

Today: Intro & Controversy in Equations



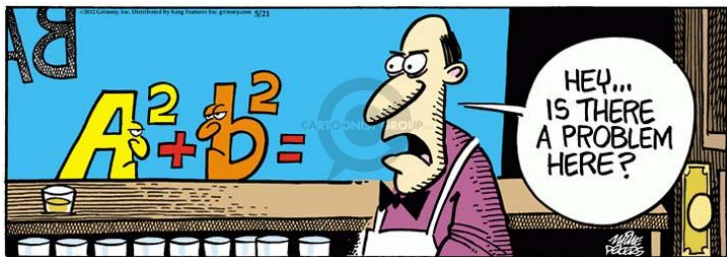
Think of an equation that is important or interesting.

Write down:

- The equation or its name
- Why you choose this equation
- What it is trying to tell us about mathematics or the world

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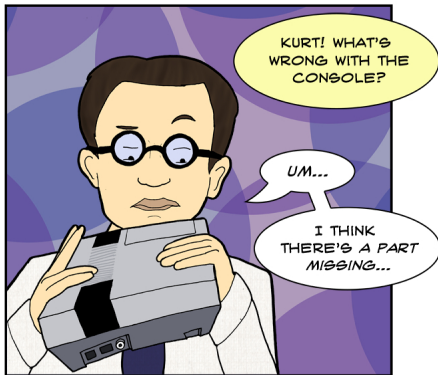
In groups of 3, share and rank them in order of their *truth*.

Controversy: Empirical versus Platonic Equations

- Empirical: approximate relational fits to experimental data
- Platonic: derived from axioms

Controversy: Empirical versus Platonic Equations

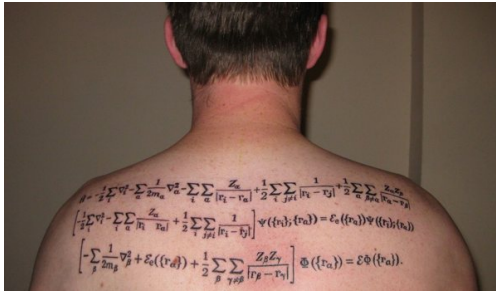
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[Gödel's incompleteness theorems]



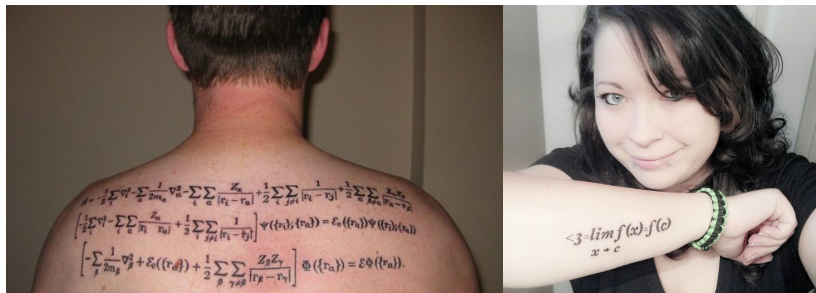
GÖDEL'S INCOMPLETE NES THEOREM



How would you define an equation?



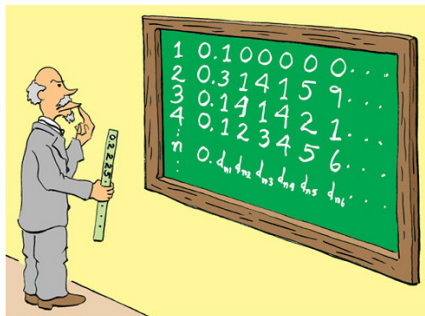
How would you define an equation?



Aristotle's Thoughts on Equals: *What is really peculiar to quantities is that we compare or contrast them in terms or on grounds of equality. We predicate 'equal', 'unequal' of all of the quantities mentioned. Of nothing, moreover, save quantities can we affirm these two terms. For we never say this disposition is 'equal' to that or 'unequal'. Such things are termed 'like' and 'unlike'*

Controversy: Comparing Infinite Quantities

- Galileo Galilei (1564-1642): sizes of infinite sets
- Georg Cantor (1845-1918)
 - revolutionary ideas on the comparison of infinite sets
 - basis of many ideas in modern mathematics, including analysis and calculus
 - mathematicians and theologians strongly objected that the work challenged the uniqueness and infinity of God
 - no recognition during his lifetime



George showed it wouldn't fit in.



MAT 4040: Senior Capstone Goals

- Professional writing, speaking and reflections on mathematics and its role in society
- Investigate mathematical knowledge - different areas
- Relate mathematics to other disciplines and society
- Understand something of the breadth of mathematics
- Reflect on ideas from the past and from abroad
- Reflect on personal development in the educational goals:
 - Thinking critically and creatively
 - Communicating effectively
 - Making local to global connections
 - Understanding responsibilities of community membership.

Grading and MAT 4040 Content

- Participation 30%
 - Homework 30% Late work will obtain at most half credit. Must be turned in by assigned final.
 - Course Project 40% Must participate to pass the class.
-
- LaTeX typesetting and standard mathematical publishing formats
 - Bibliographies and recognition of support and prior results
 - Mathematics and society and stereotypes in mathematics
 - Mathematical thought processes
 - Discussion on success and career opportunities in mathematics
 - Professional societies and their role in mathematics
 - Mathematics and the general education
 - Oral presentation styles, tools, and strategies
 - Mathematics in other cultures and the culture of mathematics
 - Topics in different areas, including “pure” and “applied”
 - Topics in the history of mathematics and mathematicians

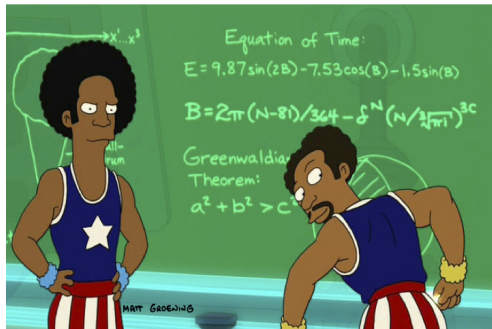
My own equation from *Bender's Big Score*

Farnsworth: *So paradox free time travel is possible after all.*

Bubblegum: *Right on. But dig this multiplicand here.*

Farnsworth: *The doom field? That must be what corrects the paradoxes.*

Curly Joe: *When that mamma rises exponentially, it could rupture the very fabric of causality.*



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Controversy with Fractions and Representing Equations

**3 OUT OF 2
PEOPLE
— HAVE —
TROUBLE
— WITH —
FRACTIONS**



Controversy with Fractions and Representing Equations



Watch the video:

<http://www.youtube.com/watch?v=AKYZhdbnOWM>

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Dennis Deturck: *Despite the fact that great historical and theoretical significance has been imported to fractions and rational numbers, its study should be deferred until it's really needed and can be appreciated, which may not be until after somebody learns calculus.*



Reflect on the speech. Share aspects that surprised you, aspects that you agreed or disagreed with, and aspects related to your own life

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💡 What are topics that were once taught and are no longer in the curriculum?

💡 What other areas and equations do fractions impact?

Beauty in Equations : $e^{i\pi} = -1$

- *It is absolutely paradoxical; we cannot understand it, and we don't know what it means, but we have proved it, and therefore we know it must be the truth. [Benjamin Peirce, 19th century]*

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- *Like a Shakespearean sonnet that captures the very essence of love, or a painting that brings out the beauty of the human form that is far more than just skin deep, Euler's Equation reaches down into the very depths of existence. [Keith Devlin]*

