# The Eye of Mathematics

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# A long time ago, in a “place” far, far away…

- Students saw patterns.
- Students made abstractions of those patterns.
- Students extended the abstraction of those patterns in search of knowledge.
- Students developed an appreciation for the effectiveness of math in our world.

# At the present time, in a “place” not so far away…

- Students see patterns.
- Students ask Google for a quick formula for the pattern.
- Students press buttons and write down something, then forget.
- Students question the relevance of math in our world.

# What happened?

- Math is (generally) poorly taught in schools.
- Math is not well understood by many who use it.
- Math is not part of popular culture like business, sports, entertainment, gaming.
- Statements like "I'm not good at math" and "I hate math" have become socially acceptable positive things to say.
- Math is perceived as rules upon rules upon rules… and devoid of any creativity.
- Most college students see math as a distraction from the tech curriculum and job they seek.
- Math is tough to teach because it's hard to learn… so we make it easier with "shallow" tech math courses.

# What happened? (Specifically in the tech math courses I teach…)

- Evaluations are "given $x$ produce $y$" metric: $x \rightarrow y$
- $x \rightarrow y$ students tend to succeed.
- $x \rightarrow z$ students tend to fail.
- Very little evaluation weight is placed on the logical thought process, "→", involved.
- Students memorize a solution algorithm "→" for each type of question
- Students "succeed" in their first semester math course, then seem to know nothing later on!

# What does the Eye of Mathematics propose?

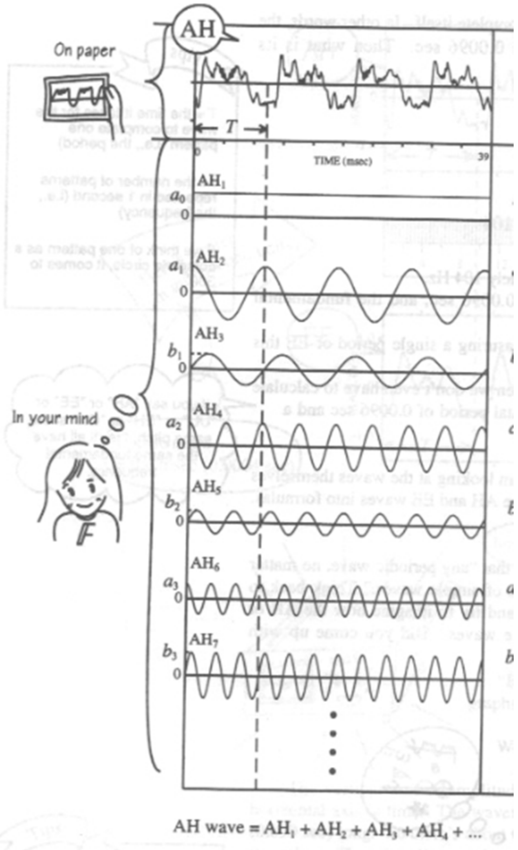
- Math must be understood.
- Evaluate the communication of the thought process “$\rightarrow$” used.
- Evaluate the effectiveness of the process in solving the problem and how it can be extended to solve other types of problems.
- $x \rightarrow y$ students may fail!
- $x \rightarrow z$ students may succeed!

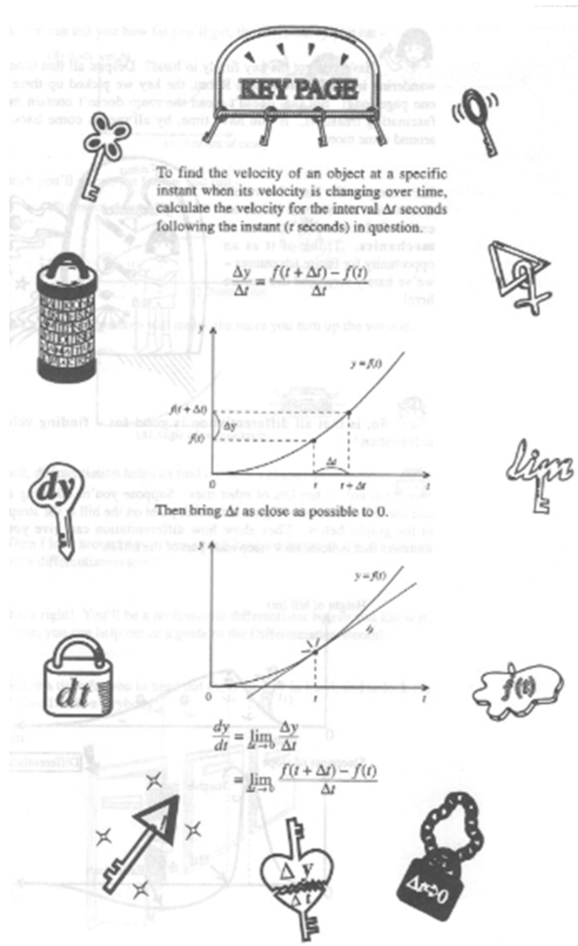
# How are we going to evaluate this? (by the numbers…)

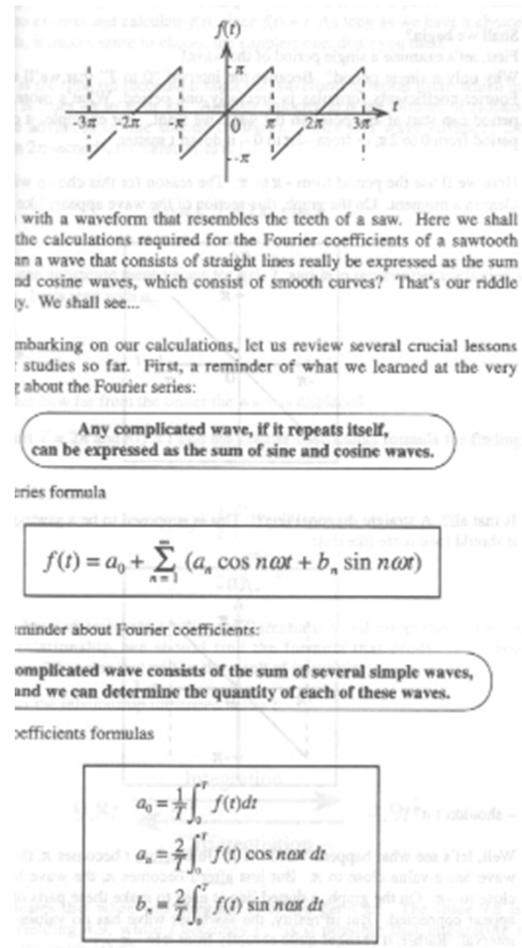
- 2+2 hrs per week
- 24 quizzes (see sample…)
- 10 group exercises/presentations (see sample…)
- 20 homework
- 2 tests
- 1 text: Who is Fourier?

# Who is Fourier?

- Read the book



# What are the goals of the Eye of Mathematics?

- Revisit math on a “guided tour”, from first principles, and challenge the FEAR of math.
- Understand the relationships between math, the “mind’s eye”, and nature.
- Literacy in the written language of math.
- Students with higher levels of confidence and self-esteem as technical professionals in a workplace where knowledge of math is an undisputed asset.
- Realization that math can be learned by ANYONE that has patience, perseverance, and the right approach.

# What are some necessary conditions for the Eye of Mathematics?

- Openness, transparency, and adaptability; this is a new course and constant feedback from faculty and students will be required to improve it.
- A constant examination of the pedagogy itself; students and instructors openly seek and explore innovations in the learning of mathematics.

# What will continue to drive the Eye of Mathematics and sustain it in our crazy/changing world?

- Math is a prerequisite to technical participation in our modern economy.
- Mathematical reasoning is NOT subject to technical obsolescence.
- Despite efforts in primary/secondary mathematics education, math skills are still declining.

# Break Point…
# Questions? Comments?

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# Where is the Eye of Math now?

- The Eye of Mathematics **1**, Fall 2017.
- Critical Performance: "…students will have demonstrated the ability to **derive and manipulate** primitive mathematical abstractions from patterns observed in physical phenomena, by means of the language of mathematics, in order to acquire deeper insights about the physical world."

# Where is the Eye of Math now?

- The Eye of Mathematics **2**, Winter 2018.
- Critical Performance: "…students will have demonstrated the ability to **combine and transform** more complex mathematical abstractions, by means of the language of mathematics, in order to arrive confidently at a series of powerful and succinct mathematical expressions for the physical world."

# What is the force that binds them?

- Learning outcome #1: “Solve basic mathematical problems using foundational mathematical representations, algorithms, and tools...”
- Learning outcome #2: “Creatively translate worded descriptions to and from mathematical expressions using foundational mathematics as a written language…”

# Use the force…

- Use the “language of mathematics” to **derive mathematical abstractions** from the patterns observed in these physical objects.

- **Manipulate the mathematical abstractions** to describe a new object; similar to the original.

# Questions? Comments? Hospitality Suite?

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