Current challenges

1. MATH 111 students are generally…
   - Stronger in computation skills
   - Weaker in interpretation skills

Computing by hand is becoming less important

Yet the course is heavily weighted toward computation

2. Students enter MATH 111 with diverse ability levels:
   - Struggle with algebra
   - Already taken calculus

3. MATH 111 is BIG:
   - 14 sections of 40 students each
   - Teaching faculty, adjunct faculty, graduate students
   - No incentives or structured support for active learning

Education research says “active learning outperforms lecture in almost every learning outcome examined.” - Felder and Brent, p. 111

Engineering learning

MATH 111 will be designed to achieve desired outcomes

Engineering Learning

Activities/exams/lessons purposefully driven by outcomes

Proposed Design

1. More class time dedicated to:
   - Communication and writing
   - Interpretation
   - Application

2. Shift computational practice online

3. Increased online remediation for struggling students

4. Group activities for higher level outcomes:
   - More interactive learning
   - Can be implemented by all instructors

Deepen your understanding

Activity outcome: Approximate functions using tangent lines

Motivating question: You want to test the depth of a well. You will drop a rock and time how long it takes to hit the ground. Does the accuracy of your approximation depend on the depth of the well?

Do you know the answer? Commit to a prediction!

Collect data: two sample depths, reaction times

Use calculus to answer the question…

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Writing exercise: Write a guide of how to apply the techniques to a new application (e.g., Poiseuille flow).