Hands on active learning design

September 19, 2022

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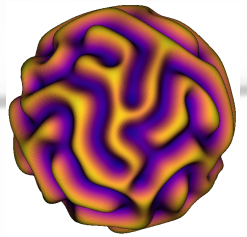


Overview and objectives

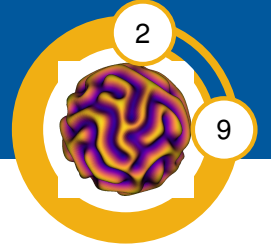
Learning objectives

You will be able to...

- Describe several learning activities broadly
- Describe one learning activity in detail
- Unpack typical math problems into smaller components
- Design and facilitate a learning activity
- Adapt active learning strategies to your teaching contexts

Three learning activities

Meta: Doing an activity about activities...



Explore activities: jigsaw discussion

1. Read through the description of one activity (~ 5 minutes)
2. Form groups of ~ 4 people who all chose different activities
3. Take turns describing the activities to each other (~ 10 minutes)

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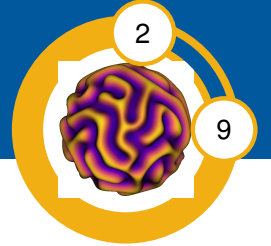

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Guiding questions

1. Inclusion?
2. Equity?
3. Forms of participation/engagement?

Finding extrema of a polynomial

Consider the function

$$f(x) = x^3 - 6x^2 + 9x + 1 \tag{1}$$

Find all global and local maxima and minima in the interval $0 \leq x \leq 5$. Classify all local extrema using the second derivative test.

Intro calculus case study

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Solution procedure

1. Differentiate the polynomial
2. Find roots of the derivative
3. Find the second derivative and evaluate it
4. Evaluate the original function at the bounds of the interval
5. Present results in a coherent manner

Intro calculus case study

Integrating to a particular area

Find the value of b such that the following holds

$$\int_0^b 4x^3 + 2x dx = 2 \tag{2}$$

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Solution procedure

1. Find antiderivative of the integrand
2. Apply fundamental theorem to get polynomial in b
3. Find roots of that to solve for b
4. Reject candidates for b if they aren't possible
5. Present results in a coherent manner

Designing an activity

Choose an activity for the problem

Unpack the problem

- What are the direct tasks? Indirect tasks?
- Is there notation or jargon?
- What prerequisite knowledge is needed?

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Map the problem onto the activity

- Aim for a ~ 10 minute activity
- How would you explain what the students need to do?
- How will you know if your students are succeeding or not?
- What can you do to make the activity inclusive?

10 minute break!

Facilitating your activities

The plan

- Each group will have 10 minutes to facilitate their activity
- Participants will do the activity, try to pretend you are a student who has never heard of this before
- After each activity take ~ 2 minutes to respond with your thoughts

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Questions for facilitators

- What went well?
- What would you change if you were to do this again?

Questions for participants

- Did you know what to do during the activity?
- Do you have any feedback for the facilitators?

Full group debrief

Discuss the design and facilitation process

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