[Gizmos - Riemann Sum](#)

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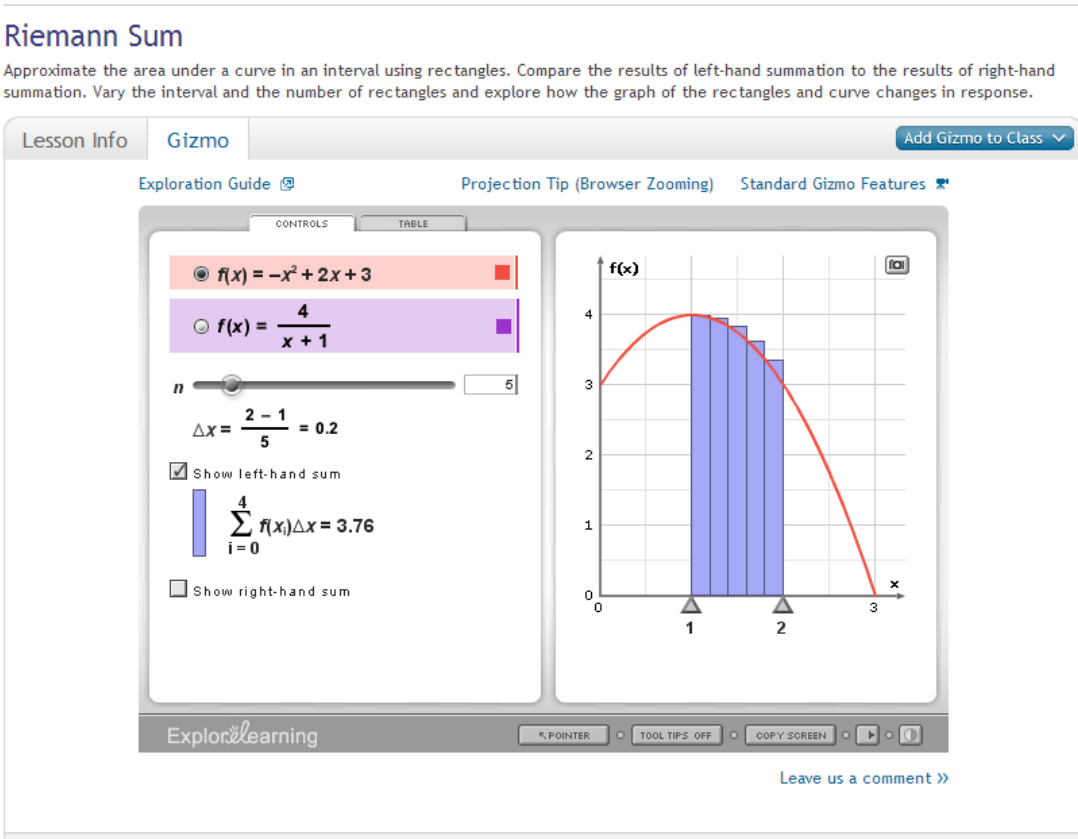

Gizmos! Online simulations that power inquiry and understanding!

This applet allows you to approximate the area under a curve in an interval using rectangles. Compare the results of left-hand summation to the results of right-hand summation. Vary the interval and the number of rectangles and explore how the graph of the rectangles and curve changes in response. (http://www.explorelearning.com/index.cfm?method=cVideos.dspVideo&id=47&c=0&r=0)

Grade Level: 10-12
PSSM Content Standard: n/a
CCSSM Content Standard: n/a
Math Content: Riemann Sums, Integrals, Calculus

Evaluation

What is being learned? What mathematics is the focus of the activity/technology? Is relational or instrumental understanding emphasized?

Students are learning what a Riemann Sum is and how it looks. Calculus, integrals, and riemann sums are the focus of the activity. A relational understanding is taking place, students are not just plugging numbers into a formula, they are able to see the number of rectangles under a curve increasing (approaching infinity, well 30 in this case, but same concept). They can also view the right-hand sum or the left-hand sum which allows them to compare and contrast.

How does learning take place? What are the underlying assumptions (explicit or implicit) about the nature of learning?

Students learn by doing. The learning is implicit because students can change the settings and make conjectures about their alterations. Students can choose to view right-hand sums, left-hand sums, or both. They can change the bounds of the area under a curve, and they can change the number of rectangles. They can switch between a view of the graph and a table view. They are able to see that the more rectangles that are drawn under the curve the more closely the right-hand sum and left-hand sum get to each other.

What role does technology play? What advantages or disadvantages does the technology hold for this role? What unique contribution does the technology make in facilitating learning?

Technology lets students see immediately the effect of drawing numerous rectangles under a curve. I have taught Riemann sums multiple times and find it extremely frustrating how long it takes to draw 4 rectangles under a curve, then to draw 10, etc. It is not very easy for students to visual more rectangles, or right-hand sums, and left-hand sums based off of my drawings alone. This is great because students can change the settings very quickly, take snap-shots of their screen (which could be dragged into a Smartboard file for future notes) or export a table.

How does it fit within existing school curriculum? (e.g., is it intended to supplement or supplant existing curriculum? Is it intended to enhance the learning of something already central to the curriculum or some new set of understandings or competencies?)

This activity would be a great supplement to a calculus course. Students in HL math are required to know Riemann sums, this gives them an exciting way to learn them. It is intended to enhance the learning of calculus. Riemann sums can be taught without technology; however, after viewing this, I will never not use it.

How does the technology fit or interact with the social context of learning? (e.g., Are computers used by individuals or groups? Does the technology/activity support collaboration or individual work? What sorts of interaction does the technology facilitate or hinder?)

The most ideal way to use this activity would be individually. Students can make changes and alter the settings at their own pace, leading them to discovering on their own. The most important reason to use this activity individually would be because of the quiz at the end. Each student gets a different 5 question quiz where the results are uploaded to your class. It could be used an introductory lesson for student to learn by discovery, it could be used to wrap up the lesson at the end of the hour, or it could be used as part of a homework assignment.

How are important differences among learners taken into account?

The activity itself allows differences among learners to be addressed. Students that need to spend more time and see more examples on a specific topic (Riemann sums in this case) have the ability to do so.

What do teachers and learners need to know? What demands are placed on teachers and other "users"? What knowledge is needed? What knowledge supports does the innovation provide (e.g., skills in using particular kinds of technology)?

Teachers have to set up an account to use gizmos (it can be a free 30 day trial, one per email address) and students must join your class. Once a teacher has a class each gizmos activity can be added and a roster can be made. Students can complete different activities and take quizzes where their results are uploaded. If a teacher wanted to just use this in the classroom with a projector or Smartboard, the graph can be made bold (it can be put into projector mode) so that students have an easier time seeing the grid, equation, and rectangles. Gizmos is very user-friendly and easy to set up a free trial account (which is what I did to explore this technology -- and I'm sold!)