Jarrod Massie

Integral Opener

Grade Level

12^{th} grade

State Goals

The student will be able to:

- Interpret the integral as the area under a curve (e.g., limit of a Riemann sum), and apply methods for approximating an integral

PASS Skill

No Calculus Pass Skills

OSAT Competency

21. Apply the principles and techniques of integral calculus to model and solve problems.

Materials Required

- ✶ paper
- ✶ pencils
- ✶ Mathematica or equivalent program

Prior Experience

We have previously worked on limits, needed to understand Riemann Sums.

Approximate Time

One class Period

Description

The instructor will open class using Mathematica or a similar program to show what happens to a rectangle when you take one side of it as a variable and take the limit as it goes to infinity and minus infinity. The teacher will then draw a simple curve on the board and ask the students to try and find a way to calculate the area under the curve. The students will break into groups and work on the problem. After about 10-15 depending on student progress, the teacher will ask groups to come up and present their solutions to the class. The class will deliberate and discuss which solution to each of the possible crossbreeds are the most accurate. The teacher will then ask the students how they think they would numerically calculate the answer to a given curve. Specifically, the curve $f(x) = x$ from $x = 2$ to $x = 5$. The teacher will ask the students how they think

they should proceed. The teacher may urge the students to draw a picture to visually represent what is happening.

Assessment

The instructor will assign some homework assignments relating the limits of Riemann sums to integrals after the next class period when this relationship is further explored. An example of this may be like express the limit $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{i^4}{n^5}$ as an integral.

Potential Difficulties

- Discovering that you can use rectangles to approximate curves and that the more of the rectangles that you use, and the smaller they become, the more accurate the approximation.
- Understanding what happens to a rectangle as the limit of its width goes to zero.
- Apply these concepts numerically to a specific curve.

Reflections