IB Math SL Year 2 Notes **Intro to Differential Calculus!**

Unit 2 – Day 1

1. **What is Calculus?**

*Calculus is a branch of mathematics that was developed when scientist mathematicians wanted to find answers to the questions: What is speed? How is instantaneous speed calculated?*

*Applications of Calculus in Physics and Engineering fields are plentiful. Velocity and acceleration are both derivatives (a calculus term we will learn about).*

1. **[](http://upload.wikimedia.org/wikipedia/commons/c/c4/EuclidStatueOxford.jpg)History Tid-Bit:**

*Calculus as we know it was developed in the 1600’s (more on that later).*

*Fundamental ideas used in calculus were in use as early as 300 BC by a guy named Euclid (a.k.a. The Father of Geometry). His book,* [*Elements*](http://en.wikipedia.org/wiki/Euclid%27s_Elements) *served as the main textbook for teaching* [*mathematics*](http://en.wikipedia.org/wiki/Mathematics) *(especially* [*geometry*](http://en.wikipedia.org/wiki/Geometry)*) from the time of its publication until the late 19th or early 20th century!*

*Shown at the right is the statue of him at Oxford University Museum of Natural History.*

1. **Investigation**

You need: a piece of paper, a partner, and a pair of scissors.

Round 1: Cut the piece of paper into 3 roughly equivalent pieces. Each partner takes one piece and leaves one piece on the desk. Record the portion of the original rectangle you have as both a fraction and as a decimal.

Round 2: Cut the “spare” piece of paper into 3 roughly equivalent pieces. Each partner takes one of those pieces and adds to your portion of the original. Record the portion of the original you now have in the same way as before. Repeat the process for four more rounds.

|  |  |
| --- | --- |
| Round Number | Portion of paper you have at the end of the round  Fraction Decimal (3 sf) |
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As you complete more and more rounds, what can you say about the portion of the original rectangle you have?

1. **Limits of Sequences:**

When terms in a sequence approach a set value (the limit), the sequence is said to be **convergent.** If not, it is said to be **divergent.**

Use limit notation to write the limit of the above investigation:

Determine if the following sequences are convergent or divergent. If they are convergent, find the limit and express in limit notation:

1. 0.3, 0.33, 0.333, 0.3333, …
2. 2, 4, 8, 16, …
3. 1/5, 6/25, 31/125, 156/625, 781/3125, …
4. 1, -1, 1, -1, …
5. **Limits of Functions**

Recall from last year that to find a limit of a function, that as x becomes sufficiently close to a given value, we are trying to find the fixed value to which f(x) is becoming close. If f(x) is not becoming close to a fixed value, we say that the limit does not exist!

Use a GDC to explore the following limits:

