Class 18: Wednesday October 15

Definition of the Definite Integral

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1. A **Riemann Sum** can be written mathematically as ...

2. A **Definite Integral** can be computed from a **Riemann Sum** by ...

AREA as a Riemann Sum

Let's look at a simple area problem for which we know we can find the answer *exactly.* 3. What is the area under the curve $f(x) = 3x$ from the origin ($x = 0$) to some point $x = L$? (HINT: what is the shape that area forms?)

4. Sketch a picture of this area in the figure below. Then we'll try and compute the answer using a Riemann Sum.

We will use a Riemann Sum using an equipartition on [0,L] with N subintervals to approximate the area. In order to do this you will need to answer a few questions:

5. What is Δx for your partition? (NOTE: An equipartition is what we call the set of points you get when you split up an interval into a number of equal parts.)

6. In general, to find Δx on an equipartition of n subintervals on $[a, b]$ the formula is...

7. Now write down a **Right-hand Riemann Sum** to approximate the shaded area.

8. What is a formula for the **exact area** under the curve, using the Riemann Sum?
(How do estimates made using Riemann Sums with N subdivisions become more accurate?)