Topics: Finding area under a curve; calculating distance traveled

An ancient problem of mathematics was to calculate areas of various shapes. While polygons were somewhat simple, shapes with curves (e.g., circles) were very difficult!

Example 1. *Use rectangles to estimate the area under the parabola* $y = x^2$ *from* 0 *to* 1.

Take-away:

The **area** A that lies under the graph of the continuous function f on the interval $[a, b]$ is the limit of the sum of the areas of approximating rectangles of width $\Delta x = \frac{b-a}{n}$:

$$A =$$

Sigma notation

We have the following nice notation for our work today:

$$\sum_{i=1}^{n} f(x_i)\Delta x =$$

1. $\sum_{i=1}^{5} i =$
2. $\sum_{i=1}^{n} i^2 =$
3. $\sum_{i=1}^{n} 1 =$
4. $\frac{1}{10}\Delta x + \frac{2}{10}\Delta x + \cdots + \frac{10}{10}\Delta x =$
5. $\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + \cdots + \frac{1}{81} =$

Example 2. *Approximate the area under the curve of* e^{-x} *between* $x = 0$ *and* $x = 2$ *using* L_4 *and* R_4*.*

Example 3. *Is* L_4 *an over estimate or under estimate?*

Take-away:

The Distance Problem

Recall that if velocity is constant then $d = rt$. However, if velocity is not constant, then how would we compute distance traveled?

Example 4. *Consider the following measured values:*

Time	0	5	10	15	20	25	30
Velocity	25	31	35	43	47	46	41.

Approximate the distance traveled.