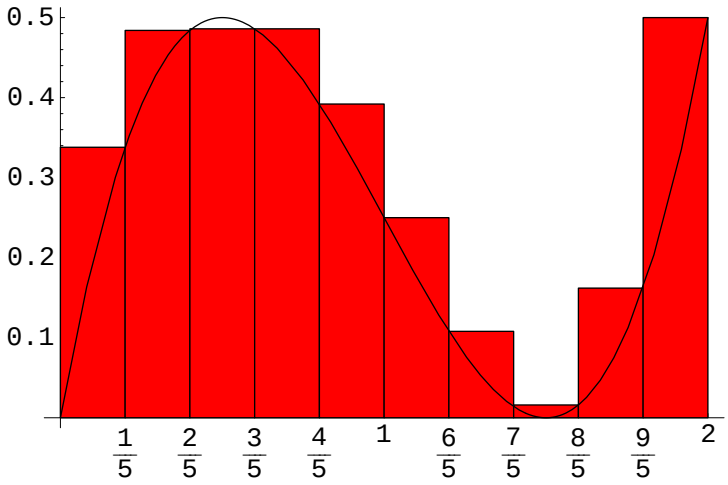
The Meaning of an Integral



$$\sum_{i=0}^{n-1} \text{area of rectangle } i$$

$$\sum_{i=0}^{n-1} \text{height of rectangle } i \times \text{ width of rectangle } i$$

$$\sum_{i=0}^{n-1} f(c_i)(x_{i+1} - x_i) \qquad \text{where } c_i \in (x_{i+1}, x_i)$$

$$\sum_{i=0}^{n-1} f(c_i)\Delta x$$

$$\int_a^b f(x)\, dx = \lim_{\|\Delta x\| \to 0} \sum_{i=0}^{n-1} f(c_i)\Delta x.$$

Note, as the width of the rectangles decreases, the number of rectangles $(n-1)$ increases.