Easy Definite Integrals

We'll do two more (much easier) examples so that we can see the pattern in these calculations.

Example: $f(x) = x$

Compute $\int_0^b f(x)\,dx$.

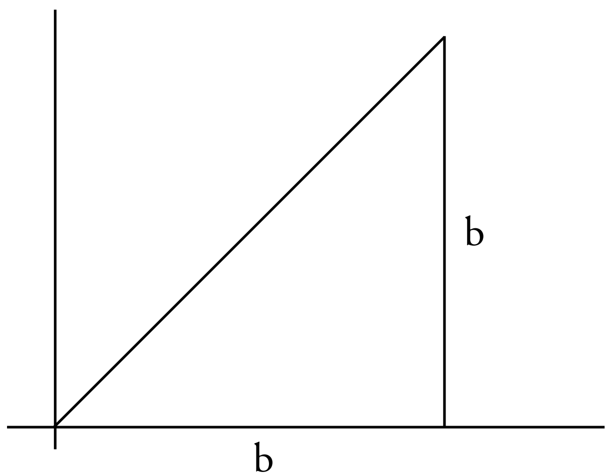

Figure 1: The area under the curve is $\int_0^b x dx$

Looking at Figure 1 we see that the area under the curve is just a triangle with area

$$\frac{1}{2}\underbrace{b}_{\text{base}} \cdot \underbrace{h}_{\text{ht}} = \frac{1}{2}b^2.$$

We conclude that $\int_0^b x\,dx = \frac{1}{2}b^2$ *without* doing any elaborate summing, because we happen to know this area.

Example: $f(x) = 1$

This is by far the most important example, but by the time you get to 18.02 and multivariable calculus you will forget this calculation.

The graph of the function is just a horizontal line. The area under that line between 0 and b is the area of a rectangle with length b and height 1. In other words,

$$\int_0^b 1\,dx = b.$$