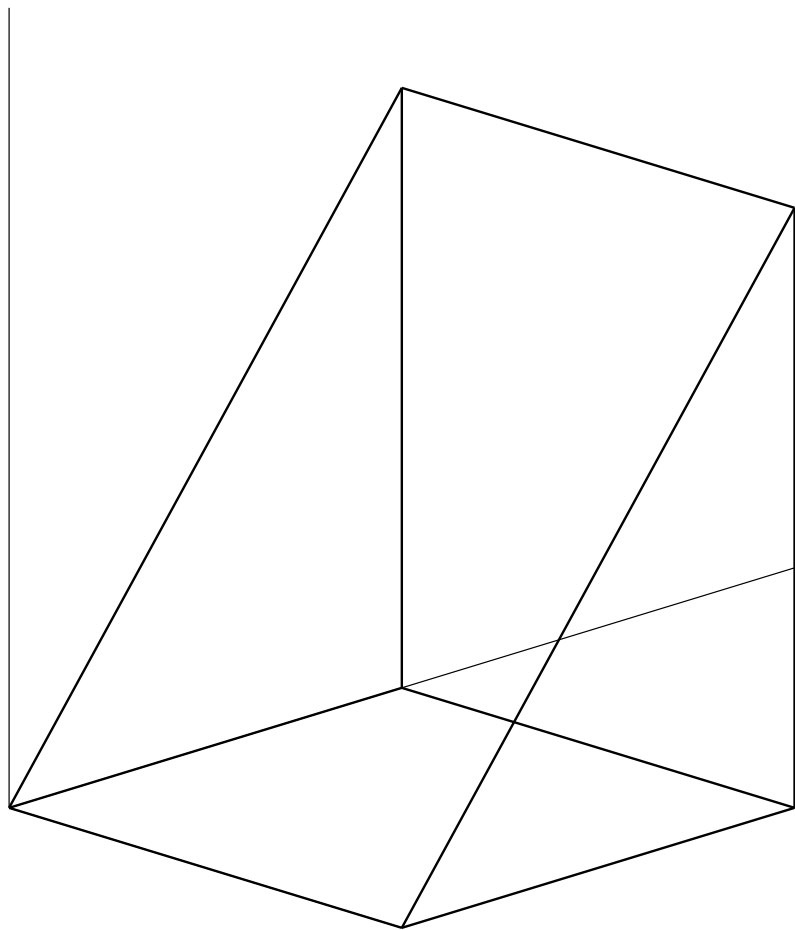
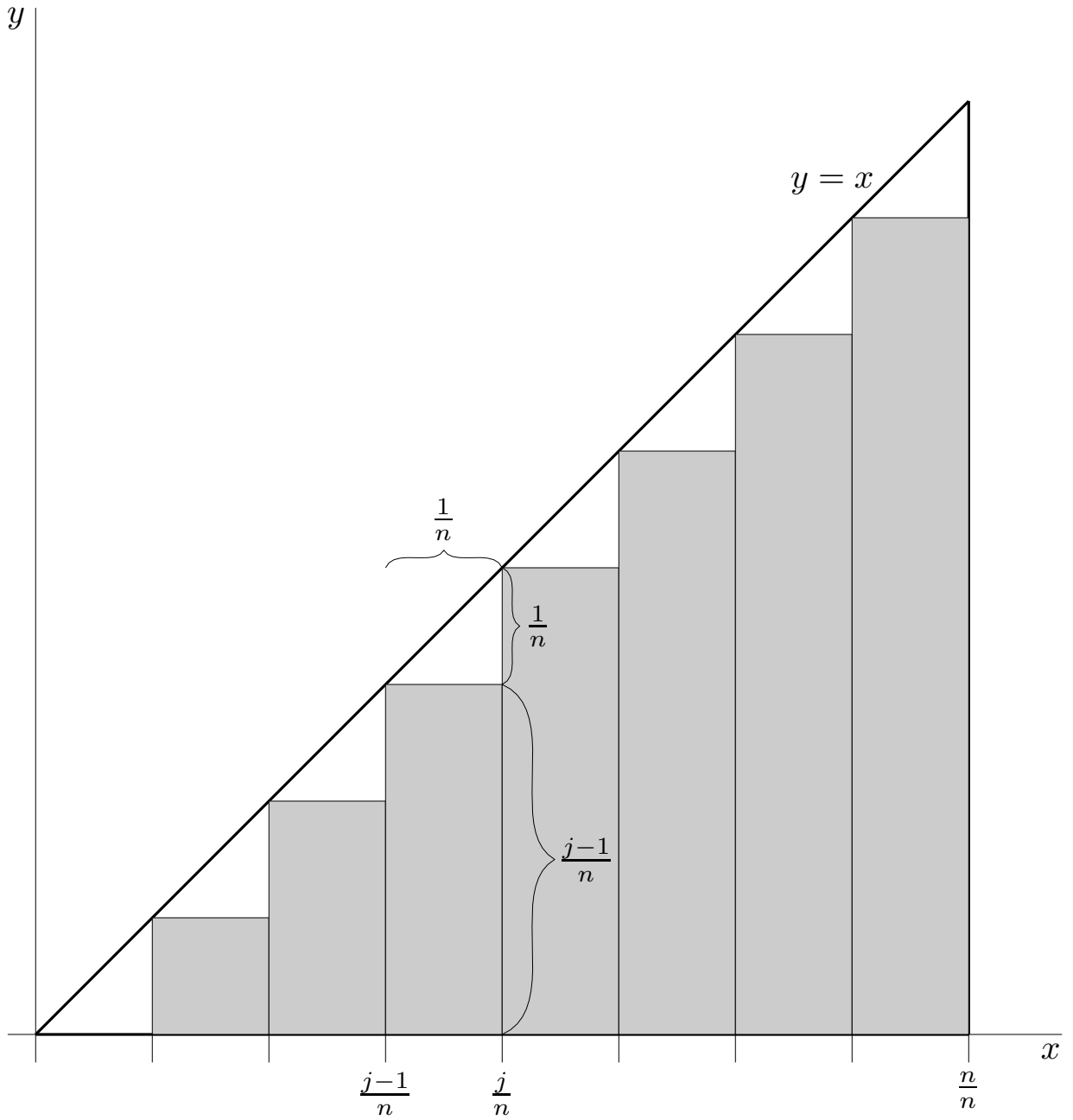


y



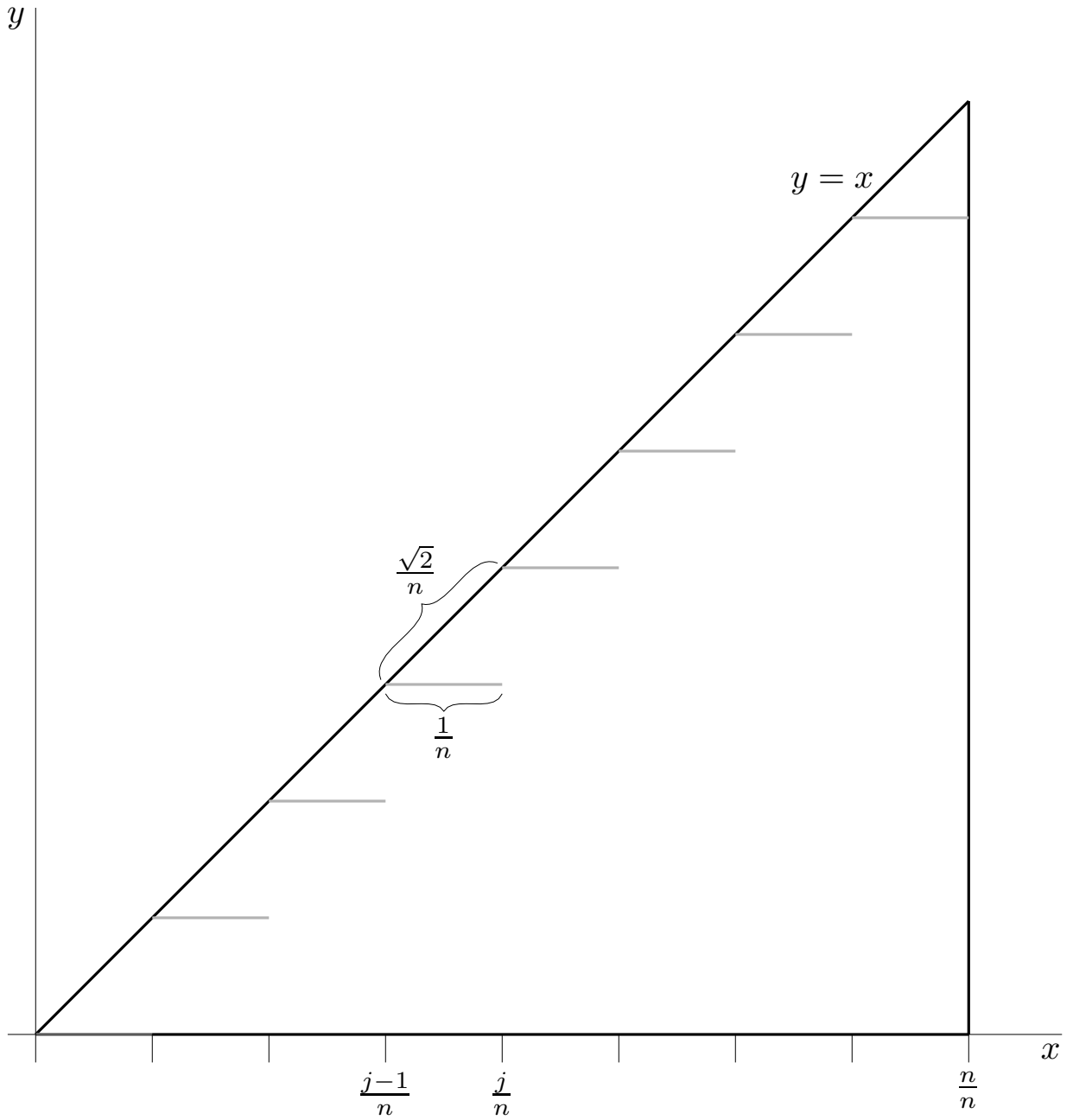
x



$$\text{Exact Volume} = \sum_{j=1}^n \left[\frac{j-1}{n} \times \frac{1}{n} + \frac{1}{2} \times \frac{1}{n} \times \frac{1}{n} \right] \times 1$$

$$= \text{Approximate Volume (shaded)} + \sum_{j=1}^n \frac{1}{2} \times \frac{1}{n} \times \frac{1}{n} \times 1$$

$$\text{Error} = n \left(\frac{1}{2n^2} \right) = \frac{1}{2n} \rightarrow 0 \text{ as } n \rightarrow \infty$$



$$\text{Exact Surface Area} = \sum_{j=1}^n \frac{\sqrt{2}}{n} \times 1$$

$$= \text{Approx Surface Area (shaded)} + \sum_{j=1}^n \frac{\sqrt{2}-1}{n} \times 1$$

$$\text{Error} = n \left(\frac{\sqrt{2}-1}{n} \right) = \sqrt{2} - 1 \text{ for all } n$$