1. Determine the upper sum for $f(x) = 2x^3$ on the interval $[0, 3]$ using 4 rectangles of equal width.

2. Determine the exact area under the curve $f(x) = |2x - 6|$ from $x = 0$ to $x = 4$.

3. Determine the exact area under the curve $f(x) = \sqrt{16 - x^2}$ from $x = -4$ to $x = 0$.

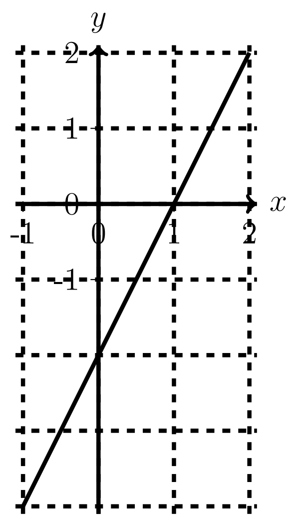
Definition. Let f be a continuous function defined on an interval $[a, b]$. Suppose that $[a, b]$ is divided into n subintervals by points $a = x_0 < x_1 < x_2 < \ldots < x_n = b$, where the width of the kth subinterval is Δx_k. The Riemann Sum of f on $[a, b]$ using using those subintervals, denoted by S_n, is

$$S_n = \sum_{k=1}^{n} f(c_k)\Delta x_k.$$

We write Δx instead of Δx_k when the points are equally spaced.

1. Determine the Riemann sum for $f(x) = 2x - 2$ on $[-1, 2]$ using 5 subintervals (n=5) and choosing the evaluation points to be the right endpoints. Illustrate the Riemann sum using the graph below. What are we approximating now?

   right endpoints



2. (a) Determine the Riemann sum S_n for $f(x) = 7x + 5$ on $[1, 4]$ using n subintervals of equal width and choosing the evaluation points to be the right endpoints.

   (b) Use $\lim_{n\to\infty} S_n$ to determine the exact area under the curve over the interval $[1, 4]$.

   (c) Check your answer to (b) using geometry.