| **Student:** Arfaz Hossain **Date:** 11/28/21	**Instructor:** UVIC Math **Course:** MATH 100 (A01, A02, A03) Fall **Assignment:** Assignment 9 2021

Using rectangles each of whose height is given by the value of the function at the midpoint of the rectangle's base (the midpoint rule), estimate the area under the graph of the following function, using first two and then four rectangles.

$f(x) = \dfrac{5}{x}$ between x = 6 and x = 10

First, graph the function. The graph of $f(x) = \dfrac{5}{x}$ is shown below.
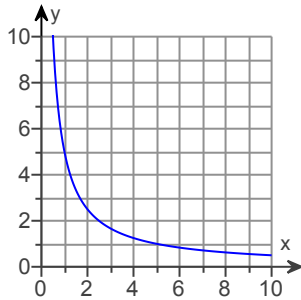
Find an estimate of the area under the curve using two rectangles of equal width.

The first rectangle should start at x = 6 and end at x = 8. The first rectangle will have a height of f(7).

How should the second rectangle be drawn on the graph?

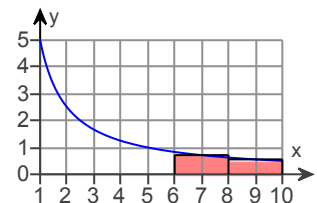The second rectangle should start at x = 8 and end at x = 10. The second rectangle will have a height of f(9).

Calculate the heights of the rectangles.

$f(7) = \dfrac{5}{7}$

$f(9) = \dfrac{5}{9}$

The graph is shown to the right with the rectangles drawn. To estimate the area under the curve, find the sum of the areas of the rectangles.

The total area of the two rectangles is $\dfrac{5}{7}(2) + \dfrac{5}{9}(2) \approx 2.540$.

Therefore, using two rectangles, the estimate for the area under the curve is 2.540.

To estimate the area under the curve using four rectangles, use the same process, but with four rectangles instead of two. How should the first rectangle be drawn on the graph?

The first rectangle should start at x = 6 and end at x = 7. The first rectangle will have a height of $f\left(\dfrac{13}{2}\right)$.

How should the second rectangle be drawn on the graph?

The second rectangle should start at x = 7 and end at x = 8. The second rectangle will have a height of $f\left(\dfrac{15}{2}\right)$.

How should the third rectangle be drawn on the graph?

The third rectangle should start at x = 8 and end at x = 9. The third rectangle will have a height of $f\left(\dfrac{17}{2}\right)$.

How should the fourth rectangle be drawn on the graph?

The fourth rectangle should start at x = 9 and end at x = 10. The fourth rectangle will have a height of $f\left(\dfrac{19}{2}\right)$.
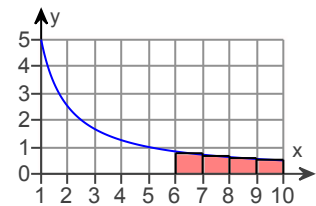
Calculate the heights of the rectangles.

$$f\left(\frac{13}{2}\right) = \frac{10}{13} \qquad\qquad f\left(\frac{17}{2}\right) = \frac{10}{17}$$

$$f\left(\frac{15}{2}\right) = \frac{2}{3} \qquad\qquad f\left(\frac{19}{2}\right) = \frac{10}{19}$$

The graph is shown to the right with the rectangles drawn. To estimate the area under the curve, find the sum of the areas of the rectangles.

The total area of the four rectangles is $\dfrac{10}{13}(1) + \dfrac{2}{3}(1) + \dfrac{10}{17}(1) + \dfrac{10}{19}(1) \approx 2.550$.

Therefore, using four rectangles, the estimate for the area under the curve is 2.550.