

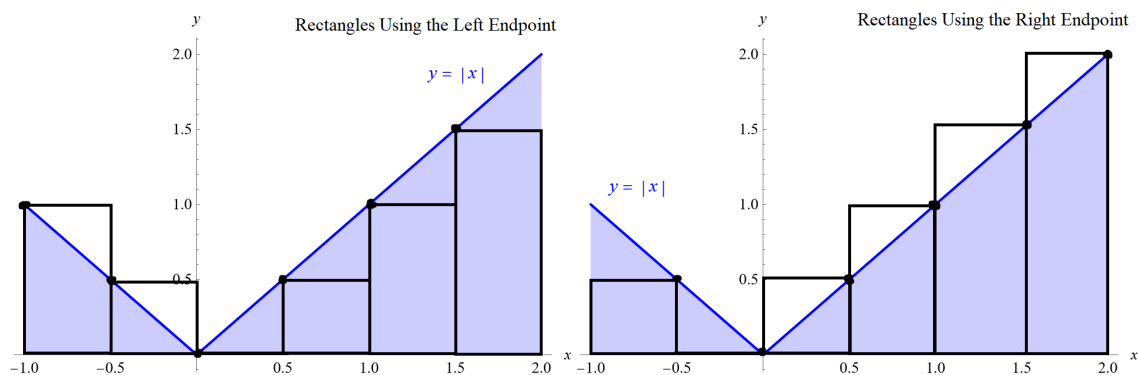
Exercise 25

For the following exercises, consider the function $f(x) = |x|$.

Use the preceding exercise to find the approximate value of the area between the x -axis and the graph of f over the interval $[-1, 2]$ using rectangles. For the rectangles, use the square units, and approximate both above and below the lines. Use geometry to find the exact answer.

Solution

The area below the graph of $f(x) = |x|$ can be found using rectangles in two ways. In the first way the top left of each rectangle touches the graph, and in the second way the top right of each rectangle touches the graph.



Add the areas of all the rectangles in each case.

$$A_{\text{Left}} \approx (0.5)(1.0) + (0.5)(0.5) + (0.5)(0) + (0.5)(0.5) + (0.5)(1.0) + (0.5)(1.5) = 2.25$$

$$A_{\text{Right}} \approx (0.5)(0.5) + (0.5)(0) + (0.5)(0.5) + (0.5)(1.0) + (0.5)(1.5) + (0.5)(2.0) = 2.75$$

These are only approximations. The exact area under the curve is found by adding the areas of the triangles.

$$A = \frac{1}{2}(1.0)(1.0) + \frac{1}{2}(2.0)(2.0) = 2.5$$