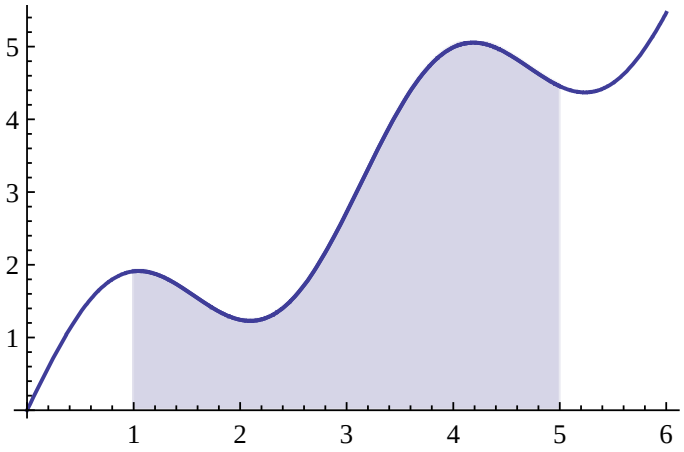
BC 2 Name:_____

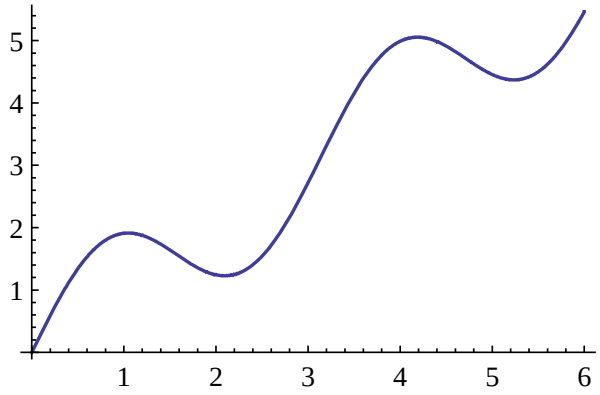
Approximations 2

On Approximations 1, we used rectangles to approximate both the distance traveled and total amount of water that leaked out. In both of those examples, the rate function was always increasing or always decreasing. Here, we want to consider this process for approximating the area under a more general function.

For our example, let $f(x) = x + \sin(2x)$. We want to approximate the area shown below, bounded by the curve, the x-axis, and the lines $x = 1$ and $x = 5$.



Left-hand Approximation



In this example, we choose $n = 5$ equal subintervals to create a "partition" of the interval [1, 5]. Thus, each will have length $\Delta x = 0.8$. Carefully draw vertical segments at each of the endpoints of all five subintervals. Then create five rectangles using the height of the function at the left-hand endpoint of each subinterval.

Complete the following lines using three decimal places to find the area of the rectangles.

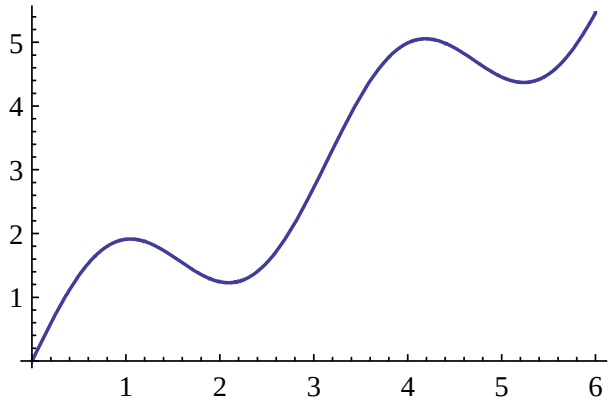
Area (1) + Area(2) + Area(3) + Area(4) + Area(5)

$= f(1)\cdot(0.8) + f(1.8)\cdot(0.8) +$

$= 1.527 +$

$=$

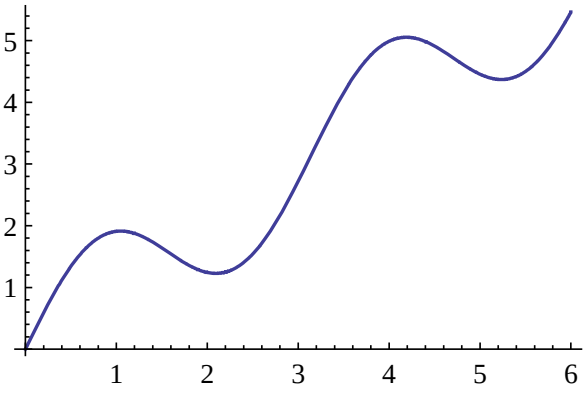
Right-Hand Approximation



We choose again to create five congruent subintervals on the interval [1, 5], each with $\Delta x = 0.8$. Draw the corresponding vertical segments. Create rectangles by using the height of the function at the right-hand endpoint of each subinterval.

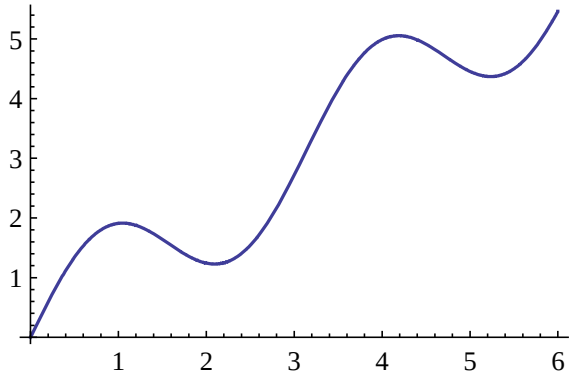
Below, create the sums and find the approximation to three decimal places as before.

Midpoint Approximation



Use the same subintervals as before. This time, find the height of each rectangle by using the value of the function at the midpoint of each subinterval. Draw the rectangles carefully, and find the area of each rectangle and the sum as before.

Approximation by Choice



Your choice! We'll continue to use five subintervals to cover the interval [1, 5], but you are to choose the width of each. (They may all be different.) Then choose an arbitrary value of x within each subinterval that will be used to find the height of the function for each rectangle. Express clearly what values you have chosen to form the sum, and then find the area to three decimal places.