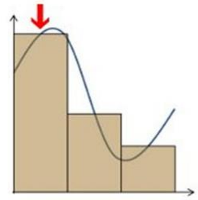
FUN	Notes Unit 6		
1	Topic: 6.2	Approximating Areas with Riemann Sums Using midpoint and Trapezoids	
Learning Objective LIM-5.A: Approximate a definite integral using geometric and numerical methods.			

Midpoint Approximation:



The middle of the base of the rectangle

Midpoint Approximation
Average of the upper and lower sums
More accurate

Example 1: Approximate the area under the curve of $f(x) = -x^2 + 2x + 11$ using 4 midpoint rectangles in the interval $[-1, 3]$.

Example 2: Approximate the area under the curve of $f(x) = x^2 - 2x + 3$ using 4 midpoint rectangles in the interval $[-1, 7]$.

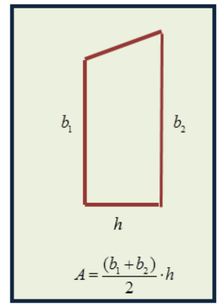
Trapezoidal Sums and The Trapezoidal Rule

As we have been seeing throughout this Topic, there are several ways of approximating an integral using geometric shapes. The trapezoid is another popular shape that is used.

The Trapezoidal Rule

Let f be continuous on [a,b]. The Trapezoidal Rule for approximating the area under a curve is

$$\text{Area} \approx \frac{b-a}{2n}[f(x_0)+2f(x_1)+2f(x_2)+2f(x_3)+2f(x_4)+\cdots+2f(x_{n-1})+f(x_n)]$$



Example 3: Using the Trapezoidal Rule to approximate the area under $f(x) = -x^2 - 2x + 9$ and above the *x*-axis on the interval [-3,2] using 5 trapezoids.

Example 4: Using the Trapezoidal Rule to approximate the area under $f(x) = \sin x$ and above the *x*-axis on the interval [0,π] using 4 trapezoids.