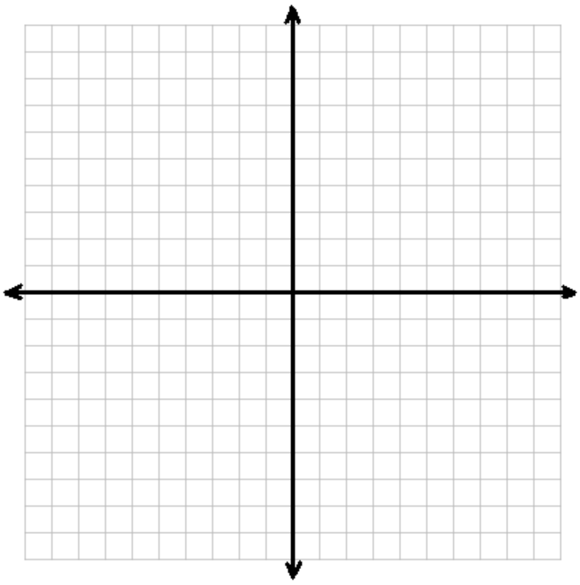
Finding Area Using Rectangles (Section 5.4)

Warm-up

Graph the function $y = 6 - \frac{1}{2}x^2$ below.

x	0	1	2	3
y				



Steps for Estimating the Area Between Curve and x-axis over [a, b]

1. ____

2. ____

3. ____

4. ____

5. ____

6. ____

Example 1

Calculate the area under the function over the interval [0, 3] using 3 rectangles by filling in the table below.

$\Delta x =$ ___________ Total Area = ___________________

i	x_i	$f(x_i)$	$A_i = \Delta x \cdot f(x_i)$
0			
1			
2			
3			

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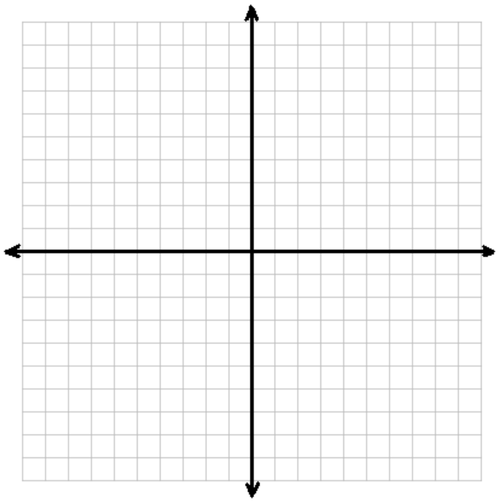
Example 2

Now calculate the same area using 6 rectangles. First redraw the graph and the rectangles, then fill in the table below.



$f(x) = 6 - \frac{1}{2}x^2$ [0, 3]

$n =$ ______ $\Delta x =$ ________

Total Area = ___________

i	x_i	$f(x_i)$	$A_i = \Delta x \cdot f(x_i)$
0			
1			
2			
3			
4			
5			
6			

Questions to Consider

1. Compare examples 1 and 2? Does the rectangle method overestimate or underestimate the area under the curve?

2. Which example does a better job estimating the area (look at the pictures)?

3. Why do you think that example does a better job?

2 Methods for Approximating the Area under a Curve

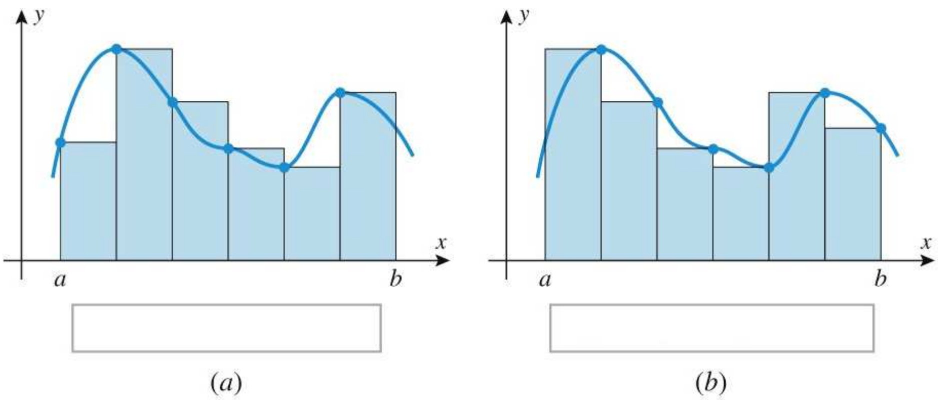


Figure 5.4.7

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Example 3: Calculate the area under the curve $f(x) = x^2 - 3$ over [2, 6] using both right endpoint and left endpoint approximation. Use 8 rectangles.

$\Delta x =$ ____________ Right Endpoint Area = ______________________

Left Endpoint Area = ______________________

i	x_i	$f(x_i)$	$A_i = \Delta x \cdot f(x_i)$
0			
1			
2			
3			
4			
5			
6			
7			
8			

Finding Area Using Rectangles (Section 5.4)

Class Work (Round to the third decimal place.)

1. Approximate the area under $f(x) = x^2 - 3x + 4$ over [1, 4] using 6 rectangles.

Δx = ___________ Right Endpoint Area = __________________________

Left Endpoint Area = __________________________

i	x_i	$f(x_i)$	$A_i = \Delta x \cdot f(x_i)$
0			
1			
2			
3			
4			
5			
6			

2. Approximate the area under $f(x) = \sqrt{x}$ over [2, 6] using 8 rectangles.

Δx = ___________ Right Endpoint Area = __________________________

Left Endpoint Area = __________________________

i	x_i	$f(x_i)$	$A_i = \Delta x \cdot f(x_i)$
0			
1			
2			
3			
4			
5			
6			
7			
8			

3. Approximate the area under $f(x) = 2^x$ over [0, 1] using 5 rectangles.

Δx = ___________ Right Endpoint Area = __________________________

Left Endpoint Area = __________________________

i	x_i	$f(x_i)$	$A_i = \Delta x \cdot f(x_i)$
0			
1			
2			
3			
4			
5			