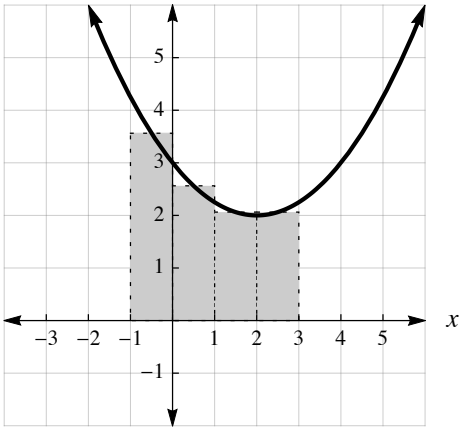
Approximating Area: Midpoints

We can also approximate the area under a curve using the *midpoint* of the rectangle, as shown in the graph below:

$$f(x) = \frac{1}{4}(x-2)^2 + 2$$



If we repeat our area calculation using the right end points, we get

Rectangle	x	$f(x) = \frac{1}{4}(x-2)^2 + 2$	$A = l \cdot w$
1	0	$f(-0.5) = \frac{1}{4}(-0.5-2)^2 + 2 = \frac{57}{16}$	$\frac{57}{16}$ or 3.5625
2	1	$f(0.5) = \frac{1}{4}(0.5-2)^2 + 2 = \frac{41}{16}$	$\frac{41}{16}$ or 2.5625
3	2	$f(1.5) = \frac{1}{4}(1.5-2)^2 + 2 = \frac{33}{16}$	$\frac{33}{16}$ or 2.0625
4	3	$f(2.5) = \frac{1}{4}(2.5-2)^2 + 2 = \frac{33}{16}$	$\frac{33}{16}$ or 2.0625

Adding up the area of all 4 rectangles gives us

$$A_{\text{total}} = \frac{57}{16} + \frac{41}{16} + \frac{33}{16} + \frac{33}{16} = \frac{41}{4} = 10.25 \text{ square units.}$$

(This is actually very close to the exact answer, which is 31/3 or $10.3\overline{33}$ square units.)