## **ANTIDERIVATIVES**

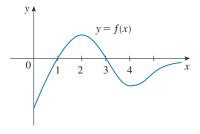


FIGURE I

**EXAMPLE A** The graph of a function f is given in Figure 1. Make a rough sketch of an antiderivative F, given that F(0) = 2.

**SOLUTION** We are guided by the fact that the slope of y = F(x) is f(x). We start at the point (0, 2) and draw F as an initially decreasing function since f(x) is negative when 0 < x < 1. Notice that f(1) = f(3) = 0, so F has horizontal tangents when x = 1 and x = 3. For 1 < x < 3, f(x) is positive and so F is increasing. We see that F has a local minimum when x = 1 and a local maximum when x = 3. For x > 3, f(x) is negative and so F is decreasing on  $(3, \infty)$ . Since  $f(x) \to 0$  as  $x \to \infty$ , the graph of F becomes flatter as  $x \to \infty$ . Also notice that F''(x) = f'(x) changes from positive to negative at x = 2 and from negative to positive at x = 4, so F has inflection points when x = 2 and x = 4. We use this information to sketch the graph of the antiderivative in Figure 2.

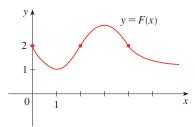


FIGURE 2