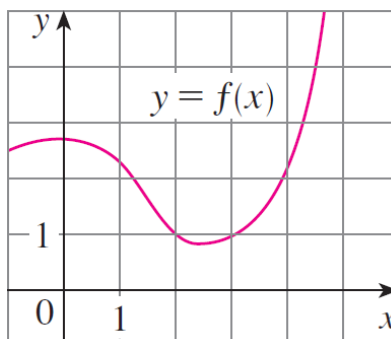


**Exercise 66**

If  $f$  is the function whose graph is shown, let  $h(x) = f(f(x))$  and  $g(x) = f(x^2)$ . Use the graph of  $f$  to estimate the value of each derivative.

- (a)  $h'(2)$                       (b)  $g'(2)$

**Solution**

Take the derivative of  $h(x)$ .

$$h'(x) = f'(f(x)) \cdot f'(x)$$

Evaluate it at  $x = 2$ .

$$\begin{aligned} h'(2) &= f'(f(2)) \cdot f'(2) \\ &= f'(1) \cdot f'(2) \\ &\approx \left(-\frac{3}{4}\right) \cdot (-1) \\ &= \frac{3}{4} \end{aligned}$$

Take the derivative of  $g(x)$ .

$$\begin{aligned} g'(x) &= f'(x^2) \cdot \frac{d}{dx}(x^2) \\ &= f'(x^2) \cdot (2x) \\ &= 2x f'(x^2) \end{aligned}$$

Evaluate it at  $x = 2$ .

$$\begin{aligned} g'(2) &= 2(2) f'(2^2) \\ &= 4f'(4) \\ &\approx 4(2) \\ &= 8 \end{aligned}$$