

**Exercise 64**

Let  $f$  and  $g$  be the functions in Exercise 63.

(a) If  $F(x) = f(f(x))$ , find  $F'(2)$ .

(b) If  $G(x) = g(g(x))$ , find  $G'(3)$ .

---

**Solution**

$x$	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	4	6
2	1	8	5	7
3	7	2	7	9

Take the derivative of  $F(x)$ .

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

Evaluate it at  $x = 2$ .

$$\begin{aligned} F'(2) &= f'(f(2)) \cdot f'(2) \\ &= f'(1) \cdot (5) \\ &= (4) \cdot (5) \\ &= 20 \end{aligned}$$

Take the derivative of  $h(x)$ .

$$G'(x) = g'(g(x)) \cdot g'(x)$$

Evaluate it at  $x = 3$ .

$$\begin{aligned} G'(3) &= g'(g(3)) \cdot g'(3) \\ &= g'(2) \cdot (9) \\ &= (7) \cdot (9) \\ &= 63 \end{aligned}$$