

**Exercise 43**

Suppose that  $f(5) = 1$ ,  $f'(5) = 6$ ,  $g(5) = -3$ , and  $g'(5) = 2$ . Find the following values.

(a)  $(fg)'(5)$

(b)  $(f/g)'(5)$

(c)  $(g/f)'(5)$ 

---

**Solution**

Calculate the derivatives using the product and quotient rules.

$$(fg)' = f'(x)g(x) + f(x)g'(x)$$

$$\left[\frac{f(x)}{g(x)}\right]' = \frac{f'(x)g(x) - g'(x)f(x)}{[g(x)]^2}$$

$$\left[\frac{g(x)}{f(x)}\right]' = \frac{g'(x)f(x) - f'(x)g(x)}{[f(x)]^2}$$

Then evaluate them at  $x = 5$ .

$$(fg)'(5) = f'(5)g(5) + f(5)g'(5) = (6)(-3) + (1)(2) = -16$$

$$\left[\frac{f(x)}{g(x)}\right]'(5) = \frac{f'(5)g(5) - g'(5)f(5)}{[g(5)]^2} = \frac{(6)(-3) - (2)(1)}{(-3)^2} = -\frac{20}{9}$$

$$\left[\frac{g(x)}{f(x)}\right]'(5) = \frac{g'(5)f(5) - f'(5)g(5)}{[f(5)]^2} = \frac{(2)(1) - (6)(-3)}{(1)^2} = 20$$