

Write your questions  
and thoughts here!

**Product Rule**

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

$$h'(x) =$$

**Find the derivative of each function.**

1.  $f(x) = 8x \sin x$

2.  $g(x) = 2e^x(\sqrt{x})$

3.  $h(x) = \left(\frac{1}{x} + 1\right)(2x^2 - 5)$

The table below shows values of two differentiable functions  $f$  and  $g$ , as well as their derivatives.

| $x$ | $f(x)$ | $f'(x)$ | $g(x)$ | $g'(x)$ |
|-----|--------|---------|--------|---------|
| 2   | 4      | -2      | -1     | 2       |
| -5  | 3      | 4       | -2     | 5       |

4.  $h(x) = 3f(x)g(x)$   
Find  $h'(2)$ .

5.  $r(x) = \left(\frac{f(x)}{2} + 2\right)(3 - g(x))$   
Find  $r'(-5)$ .

## 2.8 The Product Rule

Calculus

**Practice**

**Find the derivative of each function.**

|                             |                               |                             |                         |
|-----------------------------|-------------------------------|-----------------------------|-------------------------|
| 1. $f(x) = (2x - 3) \sin x$ | 2. $g(x) = 2x^3 e^x$          | 3. $h(x) = 4\sqrt{x} \ln x$ |                         |
| 4. $f(x) = (4 - 5x) \cos x$ | 5. $g(x) = 6 \ln x \sin x$    | 6. $h(x) = 2e^x(x^2 + x)$   |                         |
| 7. $f(x) = 8 \sin x \cos x$ | 8. $g(x) = \frac{3}{x} \ln x$ | 9. $h(x) = 2x^5 \cos x$     | 10. $f(x) = e^x \sin x$ |

**Use the table to find the value of the derivatives of each function.**

11.

| $x$ | $f(x)$ | $f'(x)$ | $g(x)$ | $g'(x)$ |
|-----|--------|---------|--------|---------|
| 7   | -5     | 3       | 2      | -3      |

a.  $h(t) = f(x)g(x)$   
Find  $h'(7)$ .

b.  $m(x) = 5f(x)g(x)$   
Find  $m'(7)$ .

c.  $s(x) = (3f(x) - 1)(g(x) + 2)$   
Find  $s'(7)$ .

12.

| $t$ | $a(t)$ | $a'(t)$ | $b(t)$ | $b'(t)$ |
|-----|--------|---------|--------|---------|
| -4  | 2      | -3      | -4     | 1       |

a.  $f(t) = a(t)b(t)$   
Find  $f'(-4)$ .

b.  $g(t) = -3a(t)b(t)$   
Find  $g'(-4)$ .

c.  $h(t) = (1 - a(t))(3b(t) + 2)$   
Find  $h'(-4)$ .

13.

| $x$ | $d(x)$ | $d'(x)$ | $h(x)$ | $h'(x)$ |
|-----|--------|---------|--------|---------|
| 1   | -3     | -2      | 4      | 3       |

a.  $a(x) = d(x)h(x)$   
Find  $a'(1)$ .

b.  $b(x) = -d(x)h(x)$   
Find  $b'(1)$ .

c.  $c(x) = \left(2 - \frac{d(x)}{2}\right)(6 - h(x))$   
Find  $c'(1)$ .

**Find the equation of the tangent line at the given  $x$ -value.**

14.  $f(x) = 8 \sin x \cos x$  at  $x = \frac{\pi}{3}$

15.  $g(x) = -2xe^x$  at  $x = 0$

## 2.8 The Product Rule

## Test Prep

16. Let  $f$  be a differentiable function with  $f(2) = 7$  and  $f'(2) = -2$ . Let  $g$  be the function defined by  $g(x) = x^2 f(x)$ . Which of the following is an equation of the line tangent to the graph of  $g$  at  $x = 2$ ?

(A)  $y - 7 = -2(x - 2)$

(B)  $y - 28 = 20(x - 2)$

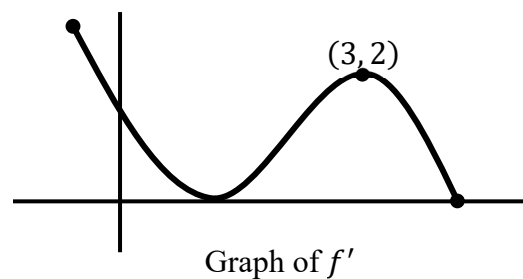
(C)  $y = 7(x - 2)$

(D)  $y - 7 = 20(x - 2)$

(E)  $y - 28 = -2(x - 2)$

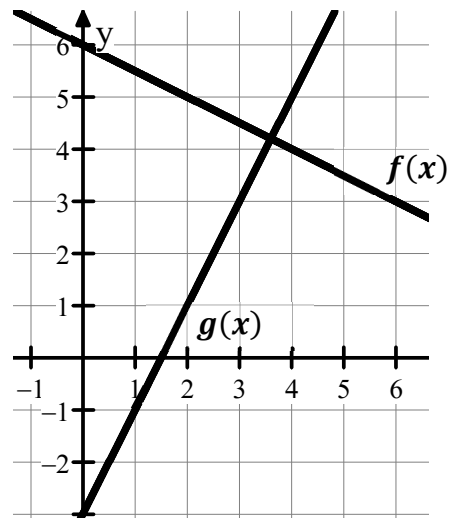
17. The figure to the right shows the graph of  $f'$ , the derivative of  $f$ . The function  $f$  is twice differentiable with  $f(3) = -1$ .

Let  $g$  be the function defined by  $g(x) = 4xf(x)$ . Find an equation for the line tangent to the graph of  $g$  at  $x = 3$ .

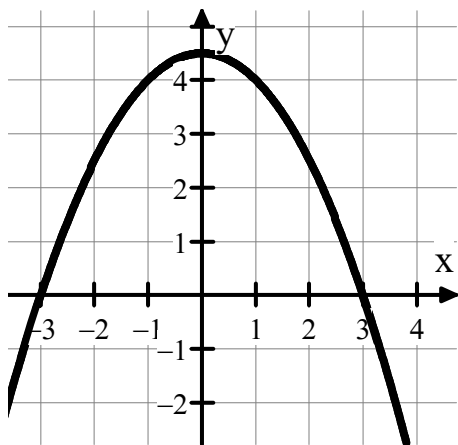


18. The graphs of  $f$  and  $g$  are shown to the right. If  $h(x) = 4f(x)g(x)$ , then  $h'(1) =$

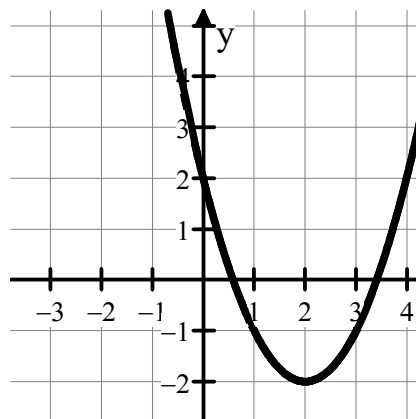
- (A)  $-22$
- (B)  $-4$
- (C)  $0$
- (D)  $4$
- (E)  $46$



19. The graphs of two differentiable functions  $f$  and  $g$  are shown below.



Graph of  $f$



Graph of  $g$

Given  $h(x) = f(x)g(x)$ , which of the following statements about  $h'(3)$  is true?

- (A)  $h'(3) < 0$
- (B)  $h'(3) = 0$
- (C)  $h'(3) > 0$
- (D)  $h'(3)$  is undefined
- (E) There is not enough information given to conclude anything about  $h'(3)$