CHAIN RULE HOMEWORK

Differentiate the functions defined in Exercises 1–26.

1 $f(x) = (x^2 - 3x + 8)^3$

2 $f(x) = (4x^3 + 2x^2 - x - 3)^2$

3 $g(x) = (8x - 7)^{-5}$

4 $k(x) = (5x^3 - 2x + 1)^{-3}$

5 $f(x) = \dfrac{x}{(x^2 - 1)^4}$

6 $g(x) = \dfrac{x^4 - 3x^2 + 1}{(2x + 3)^4}$

7 $f(x) = (8x^3 - 2x^2 + x - 7)^5$

8 $g(w) = (w^4 - 8w^2 + 15)^4$

9 $F(v) = (17v - 5)^{1000}$

10 $K(x) = (3x^2 - 5x + 7)^{-1}$

11 $s(t) = (4t^5 - 3t^3 + 2t)^{-2}$

12 $p(s) = 1/(8 - 5s + 7s^2)^{10}$

13 $N(x) = (6x - 7)^3(8x^2 + 9)^2$

14 $f(w) = (2w^2 - 3w + 1)(3w + 2)^4$

15 $g(z) = \left(z^2 - \dfrac{1}{z^2}\right)^6$

16 $S(t) = \left(\dfrac{3t + 4}{6t - 7}\right)^3$

17 $k(u) = \dfrac{(u^2 + 1)^3}{(4u - 5)^5}$

18 $g(x) = (3x - 8)^{-2}(7x^2 + 4)^{-3}$

19 $f(x) = \left(\dfrac{3x^2 - 5}{2x^2 + 7}\right)^2$

20 $M(z) = \dfrac{9z^3 + 2z}{(6z + 1)^3}$

21 $G(s) = (s^{-4} + 3s^{-2} + 2)^{-6}$

22 $F(v) = (v^{-1} - 2v^{-2})^{-3}$

23 $h(x) = [(2x + 1)^{10} + 1]^{10}$

24 $f(t) = \left[\left(1 + \dfrac{1}{t}\right)^{-1} + 1\right]^{-1}$

25 $F(t) = 2t(2t + 1)^2(2t + 3)^3$

26 $N(x) = \dfrac{7x(x^2 + 1)^2}{(3x + 10)^4}$

For each of Exercises 27–30 find (a) an equation of the tangent line to the graph of the given equation at the indicated point, and (b) the points on the graph at which the tangent line is horizontal.

27 $y = (4x^2 - 8x + 3)^4$, $P(2, 81)$

28 $y = \left(x + \dfrac{1}{x}\right)^5$, $P(1, 32)$

29 $y = (2x - 1)^{10}$, $P(1, 1)$

30 $y = (x^2 - 1)^7$, $P(0, -1)$

31 If $y = (x^4 - 3x^2 + 1)^{10}$, find dy and use it to approximate the change in y if x changes from 1 to 1.01.

32 If $w = z^3(z - 1)^5$, find dw and use it to approximate the change in w if z changes from 2 to 1.98.

30 $r = \left(\dfrac{1 + \sin\theta}{1 - \cos\theta}\right)^2$

31 *Working with Numerical Values* Suppose that the functions f and g and their derivatives with respect to x have the following values at $x = 0$ and $x = 1$.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	1	1	5	1/3
1	3	−4	−1/3	−8/3

Evaluate the derivatives with respect to x of the following combinations at the given value of x.

(a) $5f(x) - g(x)$, $x = 1$

(b) $f(x)g^3(x)$, $x = 0$

(c) $\dfrac{f(x)}{g(x) + 1}$, $x = 1$

(d) $f(g(x))$, $x = 0$

(e) $g(f(x))$, $x = 0$

(f) $(g(x) + f(x))^{-2}$, $x = 1$

(g) $f(x + g(x))$, $x = 0$