In 1-2, find the slope of the tangent line to the graph of the function at the given point.

1. $f(x) = 8 - x^2$, $(2,4)$

2. $h(t) = t^2 + 5$, $(-3,14)$

In 3-5, find the derivative by the limit process.

3. $f(x) = 1 - 2x^2$

4. $f(x) = \dfrac{1}{x+1}$

5. $f(x) = \dfrac{2}{\sqrt{x}}$

In 6-7, find an equation of the tangent line to the graph of f at the given point.

6. $f(x) = x^3$, $(-2,-8)$

7. $f(x) = \sqrt{x-6}$, $(10,2)$

In 8-9, use the alternative form of the derivative to find the derivative at x=c (if it exists).

8. $g(x) = 2x(x-1)$, $c = 1$

9. $g(x) = \dfrac{3}{x}$, $c = 2$

In 10, find the derivatives from the left and from the right at x=2 (if they exist). Is the function differentiable at x=2?

10. $f(x) = |x-2|$

In 11-18, find the derivative of the function.

11. $y = x^8$

12. $f(x) = \sqrt[7]{x}$

13. $f(x) = 2x^5 - x^3 + 5x$

14. $y = x^2 - \dfrac{1}{4}\sin x$

15. $y = \dfrac{3}{(-2x)^3} + 3\cos x$

16. $f(x) = x^3 + 7 - 5x^{-2}$

17. $f(x) = 4x + \dfrac{2}{x^2}$

18. $y = 3x(2x^2 + 1)$

In 19-20, find an equation of the tangent line to the graph of f at the given point.

19. $f(x) = -\dfrac{1}{2} + \dfrac{5}{3}x^3, \left(0, -\dfrac{1}{2}\right)$

20. $y = 2x^3 - x, \ (1,1)$

In 21-22, determine the point(s) (if any) at which the graph of the function has a horizontal tangent line.

21. $y = 2x^4 - 16x^2 + 3$

22. $y = 4x^2 + 1$

In 23, use the position function $s(t) = -16t^2 + s_0$ for free-falling objects.

23. A silver dollar is dropped from the top of a building that is 862 feet tall.
   a. Determine the position and velocity functions for the coins.
   b. Determine the average velocity on the interval [1,2].
   c. Find the instantaneous velocities when t=1 and t=2.
   d. Find the time required for the coin to reach ground level.
   e. Find the velocity of the coin at impact.

In 24-32, find the derivative using the product or the quotient rule.

24. $f(x) = (x^2 - 1)(x^3 - 2x)$

25. $f(x) = 2x^2 \cos x$

26. $g(x) = \dfrac{\sin x}{x^3}$

27. $g(t) = \dfrac{t^2 - 3}{2t + 5}$

28. $f(x) = \dfrac{3 - x - x^3}{2x^2 + 1}$

29. $f(x) = \dfrac{1 - \dfrac{3}{x}}{x + 2}$

30. $f(x) = -x + 2\tan x$

31. $f(x) = 2x\cos x + x^2 \sin x$

32. $g(t) = \sqrt[3]{t} + 5\sec t$

In 33-35, Find the second derivative of the function.

33. $f(x) = \dfrac{x^2 + 4x - 1}{3x}$

34. $f(x) = 3\cos x$

35. $f(x) = \dfrac{2x}{x - 1}$

In 36-38, find $f'(x)$ and $f'(c)$

36.
$f(x) = (x^2 - 3x)(2x^3 + 3x + 1) \quad c = 1$

37.
$f(x) = \dfrac{x^2 - 4}{x - 1} \quad c = 2$

38.
$f(x) = x\cos x \quad c = \dfrac{\pi}{2}$