HW 2.2 Basic Differentiation and Rates of Change

In 1-13, find the derivative of the function.

3. $y = 8$
5. $y = x^6$
9. $f(x) = \sqrt[5]{x}$
12. $g(x) = 3x - 1$
15. $g(x) = x^2 + 4x^3$
18. $f(x) = 2x^3 - x^2 + 3x$
21. $y = x^2 - \frac{1}{2}\cos x$
24. $y = \frac{5}{(2x)^3} + 2\cos x$
39. $f(x) = x^2 + 5 - 3x^{-2}$
42. $f(x) = x + \frac{1}{x^2}$
45. $y = x\left(x^2 + 1\right)$
48. $f(x) = \sqrt[3]{x} + \sqrt[5]{x}$
51. $f(x) = 6\sqrt{x} + 5\cos x$

In 14-16, find an equation of the tangent line to the graph of f at the given point.

33. $f(x) = -\frac{1}{2} + \frac{7}{5}x^3,\ \left(0, -\frac{1}{2}\right)$
36. $f(x) = 3(5 - x)^2,\ (5, 0)$
54. $y = x^3 + x,\ (1, 2)$

In 17-18, determine the point(s) (if any) at which the graph of the function has a horizontal tangent line.

57. $y = x^4 - 8x^2 + 2$
60. $y = x^2 + 1$

In 19-20, use the position function $s(t) = -16t^2 + v_0 t + s_0$ for free-falling objects.

93. A silver dollar is dropped from the top of a building that is 1362 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.
94. A ball is thrown straight down from the top of a 220 foot building with an initial velocity of -22 feet per second. What is its velocity after 3 seconds? What is its velocity after falling 108 feet?