3. $y = x^{\frac{1}{3}}$

$y' = \frac{1}{3}x^{-\frac{2}{3}}$

6. $h(x) = \frac{2}{3}x^{-\frac{1}{2}}$

$h'(x) = -\frac{1}{3}x^{-\frac{3}{2}}$

9. $f(x) = -x^2$

$f'(x) = -2x$

12. $y = t^3 + 2t^2 - 1$

$y' = 3t^2 + 4t$

17. $y = x^3 + \frac{4}{3}x^2 - 5x + 1$

$y' = 3x^2 + \frac{8}{3}x - 5$

22. $f(x) = \sqrt{x^3}$

$f'(x) = \frac{3}{2}x^{\frac{1}{2}}$

24. $y = \frac{x^{\frac{4}{3}}}{2}$

$y' = \frac{2}{3}x^{\frac{1}{3}}$

37. $y = x^{3/2}$

$y' = \frac{3}{2}x^{1/2}$

At the point $(1, 1)$, $y' = \frac{3}{2}(1)^{1/2} = \frac{3}{2} = m.$

38. $y = x^{-1}$

$y' = x^{-2} = -\frac{1}{x^2}$

At the point $\left(\frac{3}{4}, \frac{4}{3}\right)$, $y' = -\frac{1}{\left(\frac{3}{4}\right)^2} = -\frac{16}{9} = m.$

52. $f(x) = x^4 + \frac{1}{\sqrt{2}} - 5x^2$

$f'(x) = 4x^3 + 10x^{-3} = 4x^3 + \frac{10}{x^3}$

55. $f(x) = x^{\frac{5}{4}} + 2x$

$f'(x) = \frac{5}{4}x^{\frac{1}{4}} + 2$

59. $f(x) = \frac{3x^3 - x^2 + x + \sqrt{x}}{x} = 3x^2 - x + 1 + x^{-\frac{1}{2}}$

$f'(x) = 6x - 1 - \frac{1}{2}x^{-\frac{3}{2}} = 6x - 1 - \frac{1}{2\sqrt{x^3}}$

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

$f'(x) = 2 - x^{-2} = 2 - \frac{1}{x^2} = \frac{2x^2 - 1}{x^2}$

73. (a) 2005: $m \approx 119.2$; 2007: $m \approx 161$

(b) These results are close to the estimates in Exercise 13 in Section 2.1.

(c) The slope of the graph at time t is the rate at which sales are increasing in millions of dollars per year.

77. $C = 7.75x + 500$

$C' = 7.75$, which equals the variable cost.

78. $C = 150x + 7000$

$P = R - C$

$P = 500x - (150x + 7000)$

$P = 350x - 7000$

$P' = 350$, which equals the profit on each dinner sold.