1. (a) Average rate of change = \((f(30) - f(20))/(30 - 20) = (88 - 20)/10 = 6.8\).

(b) \((f(20) - f(10))/(20 - 10) = (20 - 10)/(20 - 10) = 1\). \(f'(20) \approx (6.8 + 1.0)/2 = 3.9\) (equivalently, \((f(30) - f(10))/(30 - 10) = (88 - 10)/10 = 3.9\).

2. Any \(\delta\) in \((0, .0399]\) will work. \((0 < \delta \leq 4\epsilon - \epsilon^2.)\)

3. (a) The statement “\(\lim_{x \to 2}(3x - 1) = 5\)” means that for every positive \(\epsilon\) there exists a positive \(\delta\) such that (for every \(x\)) if \(|x - 2| < \delta\) and \(x \neq 2\) then \(|(3x - 1) - 5| < \epsilon\).

(b) Let \(\epsilon > 0\) be given. Let \(\delta = \epsilon/3\). If \(|x - 2| < \delta\) and \(x \neq 2\), then \(|(3x - 1) - 5| = |3x - 6| = 3|x - 2| < 3\delta = 3\epsilon/3 = \epsilon\), so \(|(3x - 1) - 5| < \epsilon\). By definition of the limit (see (a)), \(\lim_{x \to 2}(3x - 1) = 5\).

4. a—2, b—3, c—1, d—6.

5. (a) \(f'(2) = \lim_{h \to 0} \frac{f(2 + h) - f(2)}{h} = \lim_{h \to 0} \frac{[(2 + h)^2 - 6(2 + h)] - [(2)^2 - 6(2)]}{h}\)

\[= \lim_{h \to 0} \frac{4 + 4h + h^2 - 12 - 6h - 4 + 12}{h} = \lim_{h \to 0} \frac{-2h + h^2}{h} = \lim_{h \to 0} (-2 + h) = -2.\]

(b) The line through \((2, f(2)) = (2, -8)\) with slope -2 is \(y - (-8) = -2(x - 2)\), or \(y = -2x - 4\).

6. Your graph of \(y = f(x)\) should be increasing for \(-3 < x < 0\), have a horizontal tangent line at \(x = 0\), be decreasing for \(0 < x < 2\), have a horizontal tangent line at \(x = 2\), and be increasing for \(2 < x < 4\).

7. (a) Dollars, number of CDs, and number of CDs per dollar

(b) i. At a price of 15 dollars, the company can sell 3,600,000 CDs.

ii. If the price is 15 dollars, the instantaneous rate of change of the number of CDs sold is -150,000 CDs per dollar, so, practically, a small increase in the price (say $1) will decrease the number of CDs sold by about 150,000 times the increase (a 150,000 sales decrease for a 1$ increase).

(c) \(f(15.5) \approx f(15) + f'(15)(0.5) = 3,600,000 - 75,000 = 3,525,000\).

8. (a) \((-3, -1), (1, 3)\) (b) \([-3, -2), (0, 2)\) (c) \((-1, 1)\)

9. Varying table values are expected. The limit is \(\ln 2 \approx 0.693\).

10. (a) \(x = 2\) (break in the graph) (b) \(x = 2, -2\) (discontinuous, corner)