Solutions to Homework Assignment 1

MATH 139-02
Section 1.1, Page 4
1-4, 10, 11, 13-17, 24, 25

1. Since the units of the independent variable are “years since 1950,” \( f(35) \) represents the population in 1950 + 35 = 1985. Because the units of the dependent variable are in millions of people, 12 represents a population of 12 million people in 1985.

2. (a) The only graph that has the distance from home equal to zero any time after \( t = 0 \) is IV, so this is the only graph illustrating a return to home.
   (b) Graph II best represents this situation; there is a long stretch of time during which the distance from home remains constant (does not change).
   (c) Graph III has the distance from home increasing at a faster rate as time goes on; it gets steeper the longer the person goes.
   (d) Here is one possible story for graph I: As I left for school, the caffeine from my quintuple-espresso was just kicking in. Soon, however, it began to wear off, and I got more and more tired. I knew I should have had a better breakfast! (This message brought to you by the National Egg Council.)

3. (a) $1000 of advertising paid off in $3500 of sales.
   (b) Since we expect sales to rise with advertising, graph I is more likely to represent this situation.
   (c) The vertical intercept is the point at which advertising is $0, so it represents the predicted sales if there is no advertising.

4. (a) At 500 feet above sea level, there are 100 bats.
   (b) At sea level, the elevation in feet is 0. Thus, there are \( k \) bats at sea level. At \( c \) feet above sea level, there are no bats at all.

10. (a) The original deposit is the balance at 0 years, so it was $1000.
    (b) It looks like \( f(10) \) is about $2200; at the end of 10 years, the balance will be around $2200.
    (c) The horizontal line \( B = 5000 \) intersects the graph around \( t = 21 \) years, so the balance will reach $5000 about 21 years after the $1000 is invested.

11. (a) The graph in III is the most reasonable; the potato should get hotter and hotter, but it shouldn’t get in any hotter than the oven, so it needs to level off sometime.
    (b) The vertical intercept represents the temperature the potato started at.

13. \( f(5) = 2(5) + 3 = 13 \).
14. \( f(5) = 10(5) - 5^2 = 25 \).
15. \( f(5) = 3 \).
16. \( f(5) = 2 \).
17. \( f(5) = 4.1 \)
24. (a) \( f(0) = 8; f(3) = 7 \).
   (b) \( f(2) = 10 \).
25. (a) \( f(0) = 0^2 + 2 = 2 \).
   (b) \( f(3) = 3^2 + 2 = 11 \).
   (c) When \( x = 3 \), \( y = 11 \). (See (b).)
   (d) There are no such values. For any real number \( x \), \( x^2 \) is at least 0. Therefore, \( x^2 + 2 \) is at least 2.