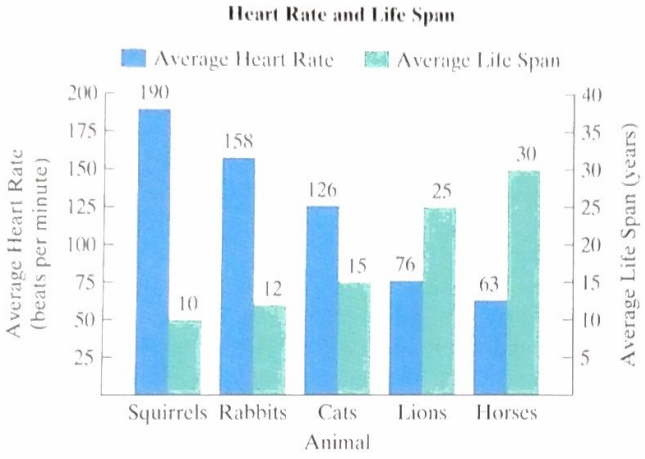
83. Heart rates and life spans of most mammals can be modeled using inverse variation. The bar graph shows the average heart rate and the average life span of five mammals.



Source: *The Handy Science Answer Book*, Visible Ink Press, 2003.

a. A mammal's average life span, L, in years, varies inversely as its average heart rate, R, in beats per minute. Use the data shown for horses to write the equation that models this relationship.

b. Is the inverse variation equation in part (a) an exact model or an approximate model for the data shown for lions?

c. Elephants have an average heart rate of 27 beats per minute. Determine their average life span.

CHAPTER 3 TEST

In Exercises 1–2, use the vertex and intercepts to sketch the graph of each quadratic function. Give the equation for the parabola's axis of symmetry. Use the graph to determine the function's domain and range.

1. $f(x) = (x + 1)^2 + 4$

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

3. Determine, without graphing, whether the quadratic function $f(x) = -2x^2 + 12x - 16$ has a minimum value or a maximum value. Then find:

a. the minimum or maximum value and where it occurs.

b. the function's domain and its range.

4. The function $f(x) = -x^2 + 46x - 360$ models the daily profit, $f(x)$, in hundreds of dollars, for a company that manufactures x computers daily. How many computers should be manufactured each day to maximize profit? What is the maximum daily profit?

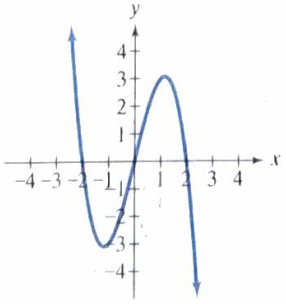
5. Among all pairs of numbers whose sum is 14, find a pair whose product is as large as possible. What is the maximum product?

6. Consider the function $f(x) = x^3 - 5x^2 - 4x + 20$.

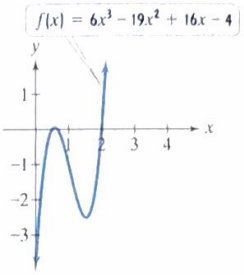
a. Use factoring to find all zeros of f.

b. Use the Leading Coefficient Test and the zeros of f to graph the function.

7. Use end behavior to explain why the following graph cannot be the graph of $f(x) = x^5 - x$. Then use intercepts to explain why the graph cannot represent $f(x) = x^5 - x$.



8. The graph of $f(x) = 6x^3 - 19x^2 + 16x - 4$ is shown in the figure.



a. Based on the graph of f, find the root of the equation $6x^3 - 19x^2 + 16x - 4 = 0$ that is an integer.

b. Use synthetic division to find the other two roots of $6x^3 - 19x^2 + 16x - 4 = 0$.

9. Use the Rational Zero Theorem to list all possible rational zeros of $f(x) = 2x^3 + 11x^2 - 7x - 6$.

10. Use Descartes's Rule of Signs to determine the possible number of positive and negative real zeros of

$$f(x) = 3x^5 - 2x^4 - 2x^2 + x - 1.$$

11. Solve: $x^3 + 9x^2 + 16x - 6 = 0$.

12. Consider the function whose equation is given by $f(x) = 2x^4 - x^3 - 13x^2 + 5x + 15$.

a. List all possible rational zeros.

b. Use the graph of f in the figure shown and synthetic division to find all zeros of the function.