Chapter 1 Review Extra Practice

1. Rationalize each denominator.

a. $\dfrac{3\sqrt{3}}{\sqrt{14} - \sqrt{7}}$

b. $\dfrac{3\sqrt{2}}{2\sqrt{3} - \sqrt{2}}$

c. $\dfrac{5\sqrt{3} + 3\sqrt{2}}{5\sqrt{2} - 4\sqrt{3}}$

d. $\dfrac{2\sqrt{3} - 3\sqrt{2}}{6\sqrt{6} - 5\sqrt{7}}$

2. Consider the graph of the function
$f(x) = -2x^2 + 4x + 3$.

a. Find the slope of the secant that joins the points on the graph given by $x = -1$ and $x = 0$.

b. Determine the average rate of change as x changes from -2 to 3.

c. Find the equation for the line tangent to the graph of the function at $x = 2$.

3. Calculate the slope of the graph of
$$f(x) = \begin{cases} -3x - 2, & \text{if } x \le -3 \\ x^2 - 2, & \text{if } x > -3 \end{cases}$$

a. at $P(-4, 10)$

b. at $P(2, 2)$

4. The height (in metres) of an object that has fallen from a height of 250 m is given by the position function $s(t) = -5t^2 + 250$, where $t \ge 0$ and t is in seconds.

a. Find the average velocity of the object between the times $t = 1$ and $t = 4$.

b. Find the average velocity of the object when $t = 3$.

c. At what velocity will the object hit the ground?

5. Complete the table and use the results to estimate the limit. Then determine the limit using an algebraic technique and compare the answer with the estimate.

$$\lim_{x \to 4} \frac{x - 4}{x^2 - x - 12}$$

x	$\dfrac{x - 4}{x^2 - x - 12}$
3.9	
3.99	
3.999	
4.001	
4.01	
4.1	

6. a. Sketch the graph of the following function.
$$f(x) = \begin{cases} x + 2, & \text{if } x < -3 \\ -x + 3, & \text{if } -3 \le x < 2 \\ x + 3, & \text{if } x \ge 2 \end{cases}$$

b. Find all values at which the function is discontinuous.

c. Find the limits at those values, if they exist.

7. Calculate each limit.

a. $\lim\limits_{x \to 1} (-2x)$

b. $\lim\limits_{x \to -3} (3x - 4)$

c. $\lim\limits_{x \to 4} (x^2 - 2x + 3)$

d. $\lim\limits_{x \to 0} 3^{\frac{x}{2}}$

8. Find constants a and b such that $f(x)$ is continuous for all values of x.
$$f(x) = \begin{cases} ax + 1, & \text{if } x > 2 \\ 3, & \text{if } x = 2 \\ x^2 + bx - a, & \text{if } x < 2 \end{cases}$$