

Chapter 9 Review

- Find all the real square roots of the number or write no real square roots
 - 144
 - 25
 - 0.16
- Evaluate $\sqrt{b^2 - 4ac}$ for each of the following sets of given values.
 - $a=4, b=5, c=1$
 - $a=-2, b=8, c=-8$
 - $a=6, b=-8, c=4$
- Use a calculator to evaluate the expression. Round the results the nearest hundredth.
 - $\frac{2 \pm 5\sqrt{3}}{5}$
 - $\frac{7 \pm 0.3\sqrt{12}}{-6}$
- Solve the equation or write no real solution. Write solutions as integers if possible. Otherwise write them as radical expressions.
 - $3x^2 = 6$
 - $a^2 + 3 = 12$
 - $7x^2 + 30 = 9$
- The sales S (in millions of dollars) of computer software in the United States from 1990 to 1995 can be modeled by $S = 61.98t^2 + 1001.15$, where t is the number of years since 1990. Use this model to estimate the year in which sales of computer software will be \$7200 million.

6. Simplify the expression

a. $\sqrt{27}$

b. $\sqrt{200}$

c. $\frac{1}{3}\sqrt{54}$

d. $\sqrt{2} \cdot \sqrt{8}$

7. Simplify the expression

a. $\sqrt{\frac{7}{9}}$

b. $3\sqrt{\frac{8}{64}}$

c. $3\sqrt{\frac{9}{3}}$

d. $\sqrt{\frac{27}{36}}$

e. $\frac{\sqrt{49}}{\sqrt{4}}$

f. $\frac{1}{2}\sqrt{32} \cdot \sqrt{2}$

g. $\frac{\sqrt{10} \cdot \sqrt{16}}{\sqrt{5}}$

8. A tsunami is a destructive, fast-moving ocean wave that is caused by an undersea earthquake, landslide or volcano. The Pacific Tsunami Warning Center is responsible for monitoring earthquakes that could potentially cause tsunamis in the Pacific Ocean. Through measuring the water level and calculating the speed of a tsunami, scientists can predict arrival times of tsunamis.

The speed (in meters per second) at which a tsunami moves is determined by the depth d (in meters) of the ocean.

$$s = \sqrt{gd}, \text{ where } g \text{ is } 9.8 \text{ meters per second per second}$$

- Find the speed of a tsunami in a region of the ocean that is 1000 meters deep. Write the result in simplified form.
 - Find the speed of a tsunami in a region of the ocean that is 4000 meters deep. Write the result in simplified form.
 - Is the speed of a tsunami at a depth of 4000 meters four times the speed of a tsunami at 1000 meters? Explain why or why not.
9. For each of the following
- Tell whether the graph of the function opens up or down.
 - Find the coordinates of the vertex.
 - Write an equation of the axis of symmetry.
- $y = -4x^2$
 - $y = 2x^2 - 10x$
 - $y = 5x^2 + 10x + 7$
 - $y = -10x^2 - 7x + 2.66$
 - $y = \frac{1}{2}x^2 + 3x - 7$
10. Sketch the graph of the function. Label the vertex.
- $y = -3x^2 + 6x - 9$
 - $y = x^2 + x + \frac{1}{4}$
 - $y = -\frac{1}{3}x^2 + 2x - 3$
 - $y = 2x^2 + 6x - 5$

11. On one of the banks of the Chicago River there is a water cannon, called the Water Arc, that sprays recirculated water across the river. The path of the Water Arc is given by the model

$$y = -0.006x^2 + 1.2x + 10$$

where x is the distance (in feet) across the river, y is the height of the arc (in feet), and 10 is the number of feet the cannon is above the river.

- What is the maximum height of the water sprayed from the Water Arc?
 - How far across the river does the water land?
12. Suppose a table-tennis ball is hit in such a way that its path can be modeled by $h = -4.9t^2 + 2.07t$, where h is the height in meters above the table and t is the time in seconds.
- Estimate the maximum height reached by the table-tennis ball. Round to the nearest tenth.
 - About how many seconds did it take for the table-tennis ball to reach its maximum height after its initial bounce? Round to the nearest tenth.
 - About how many seconds did it take for the table tennis ball to travel from the initial bounce to land on the other side of the net? Round to the nearest tenth.
13. Solve each equation algebraically. Check the solutions graphically.
- $\frac{1}{3}x^2 = 3$
 - $x^2 - 89 = 9$
 - $x^2 + 37 = 118$
14. Represent the solution graphically. Check the solution algebraically.
- $x^2 + 2x = 3$
 - $-2x^2 - 4x = -30$
15. Use a graphing calculator to approximate the solution of the equation.
- $x^2 - 3x - 4 = 0$
 - $\frac{1}{2}x^2 + 2x - 16 = 0$

16. The consumption of Swiss cheese in the United States from 1970 to 1996 can be modeled by $P = -0.002t^2 + 0.056t + 0.889$, where P is the number of pounds per person and t is the number of years since 1970. According to the graph of the model, in what year would the consumption of Swiss cheese drop to 0? Is this a realistic prediction?
17. Find the value of $b^2 - 4ac$ for each equation.
- $s^2 - 13s + 42 = 0$
 - $5x^2 + 5x + \frac{1}{5} = 0$
 - $\frac{1}{4}v^2 - 6v - 3 = 0$
18. Use the quadratic formula to solve each equation.
- $4x^2 - 13x + 3 = 0$
 - $6n^2 - 10n + 3 = 0$
 - $-2d^2 - 5d + 19 = 0$
19. Write the quadratic equation in standard form. Solve using the quadratic formula.
- $2x^2 = 4x + 30$
 - $2 - 3x + x^2 = 0$
 - $5z - 2z^2 + 15 = 8$
 - $-1 + 3x^2 = 2x$
20. Use a vertical motion model to find how long it will take for the object to reach the ground.
- You drop keys from a window 30 feet above ground to your friend below. Your friend does not catch them.
 - An acorn falls 45 feet from the top of a tree.
 - A lacrosse player throws a ball upward from her playing stick with an initial height of 7 feet, at an initial speed of 90 feet per second.
 - You throw a ball downward with an initial speed of 10 feet per second out of a window to a friend 20 feet below. Your friend does not catch the ball.

Vertical Motion Models

Object is dropped: $h = -16t^2 + s$

Object is thrown: $h = -16t^2 + vt + s$

h = height (feet) t = time in motion (seconds)

s = initial height (feet) v = initial velocity (feet per second)

21. Tell if the equation has **two** solutions, **one** solution, or **no real** solutions.

a. $-\frac{1}{3}x^2 + x + 4 = 0$

b. $2x^2 - 4x + 3 = 0$

c. $3x^2 - 6x + 3 = 0$

22. Consider the equation $\frac{1}{2}x^2 + \frac{2}{3}x - 3 = 0$.

a. Evaluate the discriminant.

b. How many solutions does the equation have?

c. What does the discriminant tell you about the graph of $y = \frac{1}{2}x^2 + \frac{2}{3}x - 3$?

Does the graph cross the x -axis?

23. You and a friend are playing basketball. You can jump with an initial velocity of 12 feet per second. You need to jump 2.2 feet to dunk a basketball. Your friend can jump with an initial velocity of 14 feet per second. Your friend needs to jump 3.4 feet to dunk a basketball.

a. Can you dunk the ball? Can your friend? Justify your answers.

b. Suppose you can jump with an initial velocity of 11.5 feet per second and your friend can jump with an initial velocity of 15.5 feet per second. How, if at all, would this change your answers to part a?

23. You are a financial analyst for a software company. You have been asked to project the net profit of your company. The net profit of the company for 1993 to 1998 can be modeled by $P = 6.84t^2 - 3.76t + 9.29$ where P is the profit in millions of dollars and t represents the number of years since 1993.

a. Use the model to predict whether the net profit will reach 650 million dollars.

b. Use a graphing calculator to estimate how many years it will take for the company's net profit to reach 475 million dollars according to the model.

23. Is the ordered pair $(-3, 10)$ a solution of the inequality $y < x^2 + 9x$?

24. Graph the following inequalities:

a. $y \geq -2x^2 - 2x + 1$

b. $y < 2x^2 - x - 3$

c. $y \leq 2x^2 + x + 1$

d. $y > -4x^2 + 6x - 5$

25. The Golden Gate Bridge connects northern California to San Francisco. The vertical cables that are suspended from the main cable lie in the region given by $0 \leq y \leq 0.000112x^2 + 5$ where x is the horizontal distance from the middle of the bridge (in feet) and y is the vertical distance (in feet) above the road.

a. How high are the towers above the road?

b. Sketch a graph of the region between the towers and under the main cable.

26. Make a scatter plot of each set of data below. Then name the type of model that best fits the data.

a. $(-1, -6), (-3, 4), (2, 9), (-2, -3), (0, -6), (1, 0)$

b. $(-2, -1), (-1, -2.5), (0, 3), (1, -2.5), (2, -1), (3, 1.5)$

c. $(-2, 2), (-1, \frac{3}{2}), (0, 3), (1, \frac{7}{2}), (2, 4), (3, \frac{9}{2})$

d.

x	y
-1	8
1	2
-2	16
3	0.5
0	4
2	1

27. Body mass index is a measure of weight in relation to height. The table shows the body mass index B of a person who is 152 centimeters and weights w kilograms.

Which type of model best fits the data? Write a model.

Weight, w	45.40	49.94	54.58	59.02	63.56	68.10	72.64
Body mass index, B	19.55	21.50	23.46	25.41	27.37	29.32	31.28