Name _____ Date _____

9.3 Notetaking with Vocabulary

Core Concepts

Methods of solving quadratics that you have learned previously:

1. Graphing (9.1)
2. Factoring (Ch. 7)

Solving Quadratics by "Taking the Square Root"

Use when $b = 0$

something squared = #

$(x + a)^2 = d$

Solutions of $x^2 = d$

- When $d > 0, x^2 = d$ has two real solutions, $x = \pm\sqrt{d}$.
- When $d = 0, x^2 = d$ has one real solution, $x = 0$.
- When $d < 0, x^2 = d$ has no real solutions.

In Exercises 1–14, solve the equation using square roots.

1. $x^2 + 49 = 0$

$-49 \quad -49$

$x^2 = -49$

no real solutions

2. $x^2 - 25 = 0$

$+25 \quad +25$

$\sqrt{x^2} = \pm\sqrt{25}$

$x = \pm 5$

3. $x^2 + 6 = 6$

$-6 \quad -6$

$\sqrt{x^2} = \sqrt{0}$

$x = 0$

no b

4. $2x^2 + 84 = 0$

$-84 \quad -84$

$\frac{2x^2}{2} = \frac{-84}{2}$

$x^2 = -42$

No real solutions

5. $-x^2 - 12 = -12$

$+12 \quad +12$

$\frac{-x^2}{-1} = \frac{0}{-1}$

$\sqrt{x^2} = \sqrt{0}$

$x = 0$

6. $8x^2 - 49 = 151$

$+49 \quad +49$

$\frac{8x^2}{8} = \frac{200}{8}$

$x^2 = 25$

$\sqrt{x^2} = \pm\sqrt{25}$

$x = \pm 5$

7. ~~$-3x^2 + 16 = 11$~~

$x^2 + 6 = 13$

$x^2 = 7$

$\sqrt{x^2} = \pm\sqrt{7}$

$x = \pm\sqrt{7}$

8. $81x^2 - 49 = -24$

$+49 \quad +49$

$\frac{81x^2}{81} = \frac{25}{81}$

$\sqrt{x^2} = \pm\sqrt{\frac{25}{81}}$

$x = \pm\frac{5}{9}$

9. ~~$25x^2 + 9 = 0$~~

$2x^2 - 29 = 11$

$+29 \quad +29$

$\frac{2x^2}{2} = \frac{40}{2}$

$\sqrt{x^2} = \pm\sqrt{20}$

$x = \pm\sqrt{20}$

$x = \pm\sqrt{4}\cdot\sqrt{5}$

$x = \pm 2\sqrt{5}$

something sq = #

10. $16 - 2x^2 = 16$

11. $(x - 4)^2 = 0$

$\sqrt{(x-4)^2} = \sqrt{0}$

$x - 4 = 0$

$+4 \quad +4$

$\boxed{x = 4}$

12. $(2x + 7)^2 = 49$

$\sqrt{(2x+7)^2} = \pm\sqrt{49}$

$2x + 7 = \pm 7$

$-7 \quad -7$

$2x = -7 \pm 7$

$2x = -7 + 7$ or $2x = -7 - 7$

$\frac{2x}{2} = \frac{0}{2}$ or $\frac{2x}{2} = \frac{-14}{2}$

$x = 0$ or $x = -7$

13. $\frac{16(x-3)^2}{16} = \frac{25}{16}$

$(x-3)^2 = \frac{25}{16}$

$\sqrt{(x-3)^2} = \pm\sqrt{\frac{25}{16}}$

$\frac{3}{1} = \frac{12}{4}$ $\quad x - 3 = \pm\frac{5}{4}$

$x - 3 = \frac{5}{4}$ or $x - 3 = \frac{-5}{4}$

$+\frac{12}{4} \quad +\frac{12}{4} \qquad +\frac{12}{4} \quad +\frac{12}{4}$

$x = \frac{17}{4}$ $\qquad x = \frac{7}{4}$

14. $\frac{81(3x+1)^2}{81} = \frac{49}{81}$

$(3x+1)^2 = \frac{49}{81}$

$\sqrt{(3x+1)^2} = \pm\sqrt{\frac{49}{81}}$

$3x + 1 = \pm\frac{7}{9}$

$3x = \frac{7}{9} - \frac{9}{9}$ $\qquad 3x = \frac{-7}{9} - \frac{9}{9}$

$\frac{1}{3}\cdot 3x = -\frac{2}{9}\cdot\frac{1}{3}$ $\qquad \frac{1}{3}\cdot 3x = -\frac{16}{9}\cdot\frac{1}{3}$

$x = \frac{-2}{27}$ $\qquad x = \frac{-16}{27}$

give precise answer

In Exercises 15–19, solve the equation using square roots. Round your solutions to the nearest hundredth.

15. $x^2 + 6 = 8$

$\sqrt{x^2} = \pm\sqrt{2}$

$x = \pm\sqrt{2}$

$x \approx \pm 1.41$

16. $x^2 - 12 = 3$

17. $3x^2 - 4 = 14$

$+4 \quad +4$

$\frac{3x^2}{3} = \frac{18}{3}$

$\sqrt{x^2} = \pm\sqrt{6}$

$x = \pm\sqrt{6}$

$x \approx \pm 2.45$

18. A ball is dropped from a window at a height of 81 feet. The function $h = -16x^2 + 81$ represents the height (in feet) of the ball after x seconds. How long does it take for the ball to hit the ground?

$0 = -16x^2 + 81$

$-81 \qquad -81$

$\frac{-81}{-16} = \frac{-16x^2}{-16}$

$\pm\sqrt{\frac{81}{16}} = \sqrt{x^2}$

discard negative

$\pm\frac{9}{4} = x$

$\pm 2.25 = x$

The ball hits the ground after 2.25 seconds.

19. The volume of a cone with height h and radius r is given by the formula $V = \frac{1}{3}\pi r^2 h$. (1) Solve the formula for r. (2) Then find the radius of a cone with volume 27π cubic inches and height 4 inches.

(1) $V = \frac{1}{3}\pi r^2 h$

$\frac{3V}{\pi h} = \frac{\pi r^2 h}{\pi h}$

$\sqrt{\frac{3V}{\pi h}} = \sqrt{r^2}$

$\sqrt{\frac{3V}{\pi h}} = r$

(2) $r = \sqrt{\frac{3V}{\pi h}}$

$r = \sqrt{\frac{3(27\pi)}{\pi(4)}}$

$r = \sqrt{\frac{81\pi}{4\pi}}$

$r = \sqrt{\frac{81}{4}}$

$r = \frac{9}{2} = 4\frac{1}{2}$ inches

The radius is $4\frac{1}{2}$ inches.