Name ______________________ Period ________

5.2H *Solve Quadratic Equations Using Square Roots to Find Real or Complex Solutions*

#1 – 6: Simplify the following radicals.

1. $\sqrt{-9}$

$\boxed{3i}$

2. $7\sqrt{-50}$

$7\sqrt{-1\cdot 25\cdot 2}$

$7i5\sqrt{2}$

$\boxed{35i\sqrt{2}}$

3. $2\sqrt{-3}$

$\boxed{2i\sqrt{3}}$

4. $3\sqrt{-100}$

$\boxed{30i}$

5. $11\sqrt{-18}$

$11\sqrt{-1\cdot 9\cdot 2}$

$\boxed{33i\sqrt{2}}$

6. $\sqrt{-121}$

$\boxed{11i}$

7. What is the value of i^2? $\boxed{-1}$

#8 – 13: Simplify the following complex expressions.

8. $(3i)^2$

$9i^2$

$\boxed{-9}$

9. $(-5i)^2$

$25i^2$

$\boxed{-25}$

10. $(-i)^2$

$i^2 =$

$\boxed{-1}$

11. $(3-5i)^2$

$9-30i+25i^2$

$9-30i-25$

$\boxed{-16-30i}$

12. $2(3+4i)^2$

$2(9+24i+16i^2)$

$2(-7+24i)$

$\boxed{-14+48i}$

13. $(-2-7i)^2+5$

$4+28i+49i^2+5$

$4+28i-49+5$

$\boxed{-40+28i}$

#14 – 17: Verify that each of the following values are solutions to the given equation. Show all of your work.

14. $-2x^2+3=21;\ x=3i, x=-3i$

$-2(3i)^2+3 = 21$

$-2(9i^2)$

$-2(9)(-1)$

$18+3=21$ ✓

$-2(-3i)^2+3 = 21$

$-2(9i^2)$

$-18i^2$

$18+3=21$ ✓

15. $(x-5)^2-1=-17;\ x=5+4i, x=5-4i$

$((5+4i)-5)^2-1 = -17$

$(4i)^2$

$16i^2$

$-16-1=-17$ ✓

$((5-4i)-5)^2-1=-17$

$(-4i)^2-1$

$16i^2$

$-16-1 = -17$ ✓

Name ______________________ Period __________

5.2H Solve Quadratic Equations Using Square Roots to Find Real or Complex Solutions

#14 – 17 (continued): Verify that each of the following values are solutions to the given equation. Show all of your work.

16. $x^2+11=7;\ x=2i, x=-2i$

$(2i)^2+11=7$

$4i^2+11$

$4(-1)+11=7$ ✓

$(-2i)^2+11=7$

$4i^2$

$-4+11=7$ ✓

17. $(x+2)^2=-25;\ x=-2+5i, x=-2-5i$

$((-2+5i)+2)^2=-25$

$(5i)^2$

$25i^2$

$25(-1)=-25$ ✓

$((-2-5i)+2)^2=-25$

$(-5i)^2$

$25i^2$

$25(-1)=-25$ ✓

#18 – 21: Solve each equation for real or complex solutions. Verify your solutions.

18. $x^2+3=51$

$\sqrt{x^2}=\sqrt{48}$

$|x|=\sqrt{16\cdot 3}$

$\boxed{x=\pm 4\sqrt{3}}$

✓Verify your solution(s):

$(4\sqrt{3})^2+3=51$

$16\cdot 3+3=51$ ✓

$(-4\sqrt{3})^2+3$

$16\cdot 3+3=51$ ✓

19. $\sqrt{(x-1)^2}=\sqrt{-24}$

$|x-1|=\sqrt{-1\cdot 4\cdot 6}$

$x-1=\pm 2i\sqrt{6}$

$\quad +1 \quad +1$

$\boxed{x=1+2i\sqrt{6},\ x=1-2i\sqrt{6}}$

✓ Verify your solution(s):

$((1+2i\sqrt{6})-1)^2=-24$

$(2i\sqrt{6})^2$

$4i^2\cdot 6$

$24(-1)=-24$ ✓

$((1-2i\sqrt{6})-1)^2=-24$

$(-2i\sqrt{6})^2$

$4i^2\cdot 6$

$24(-1)=-24$ ✓

Name ____________________________ Period __________.

5.2H Solve Quadratic Equations Using Square Roots to Find Real or Complex Solutions

#18 – 21 (continued): Solve each equation for real or complex solutions. Verify your solutions.

20. $3x^2 - 27 = 0$

$3x^2 = 27$

$\sqrt{x^2} = \sqrt{9}$

$|x| = 3$

$\boxed{x = 3 \text{ or } x = -3}$

✓Verify your solution(s):

$3(3)^2 - 27 = 0$

$3 \cdot 9 - 27 = 0$ ✓

$3(-3)^2 - 27$

$3 \cdot 9 - 27 = 0$ ✓

21. $5(x+1)^2 - 3 = -48$

$+3 \quad +3$

$5(x+1)^2 = -45$

$\sqrt{(x+1)^2} = \sqrt{-9}$

$|x+1| = 3i$

$x+1 = \pm 3i$

$\boxed{x = -1 + 3i,\ x = -1 - 3i}$

✓ Verify your solution(s):

$5((-1+3i)+1)^2 - 3 = -48$

$5(3i)^2$

$5 \cdot 9i^2$

$45i^2$

$-45 - 3 = -48$ ✓

$5((-1-3i)+1)^2 - 3 = -48$

$5(-3i)^2$

$5 \cdot 9i^2$

$45i^2$

$-45 - 3 = -48$ ✓

22. The height, h, of a water balloon (in feet) at time t (in seconds) is given by the equation $h(t) = -16(t - 0.45)^2 + 32$. If a student throws the balloon and it lands on the ground, how long is the balloon in the air? Verify your solution(s).

$0 = -16(t - .45)^2 + 32$

$-32 = -16(t - 0.45)^2$

$\sqrt{2} = \sqrt{(t-0.45)^2}$

$\pm\sqrt{2} = |t - 0.45|$

* $\boxed{t = 0.45 + \sqrt{2}}$, $t \approx 1.86$ sec

$t = 0.45 - \sqrt{2} \approx -.96$ extraneous

$-16(1.86 - .45)^2 + 32 = 0$

$(1.41)^2$

$-16(1.9881) + 32$

* $0.1904 \approx 0$ ✓

* Using $t \approx 1.8642$ to 4 decimal places yields $0 = 0$ ✓

#23 – 26: Find the real and/or complex roots of each function. Verify your solutions!

23. $f(x) = x^2 - 125$

$x^2 - 125 = 0$

$\sqrt{x^2} = \sqrt{125}$

$|x| = \sqrt{25 \cdot 5}$

$\boxed{x = 5\sqrt{5} \text{ or } x = -5\sqrt{5}}$

✓Verify your solution(s):

$(5\sqrt{5})^2 - 125 = 0$

$25 \cdot 5 - 125 = 0$ ✓

$(-5\sqrt{5})^2 - 125 = 0$

$25 \cdot 5 - 125 = 0$ ✓

24. $f(x) = (x+7)^2$

$\sqrt{(x+7)^2} = \sqrt{0}$

$|x+7| = 0$

$x + 7 = 0$

$\boxed{x = -7}$

✓ Verify your solution(s):

$(-7+7)^2 = 0$

$0^2 = 0$ ✓

5.2H Solve Quadratic Equations Using Square Roots to Find Real or Complex Solutions

#23 – 26 (continued): Find the real and/or complex roots of each function. Verify your solutions!

25. $f(x) = -2(x-2)^2 - 18$

$-2(x-2)^2 - 18 = 0$

$-2(x-2)^2 = 18$

$\sqrt{(x-2)^2} = \sqrt{-9}$

$|x-2| = 3i$

$x-2 = \pm 3i$

$\boxed{x = 2+3i, x = 2-3i}$

✓Verify your solution(s):

$-2(2+3i-2)^2 - 18 = 0$

$-2(3i)^2$

$9i^2$

$-2(-9) - 18 = 0$ ✓

$-2(2-3i-2)^2 - 18 = 0$

$-2(-3i)^2$

$9i^2$

$-2(-9) - 18 = 0$ ✓

26. $f(x) = 4x^2 + 24$

$4x^2 + 24 = 0$

$4x^2 = -24$

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

$|x| = i\sqrt{6}$

$\boxed{x = i\sqrt{6} \text{ or } -i\sqrt{6}}$

✓ Verify your solution(s):

$4(i\sqrt{6})^2 + 24 = 0$

$4 \cdot i^2 \cdot 6$

$-24 + 24 = 0$ ✓

$4(-i\sqrt{6})^2 + 24 = 0$

$4(i^2 \cdot 6)$

$-24 + 24 = 0$ ✓

27. The area of a square can be found using the formula $A = s^2$, where "A" is the area and "s" is the length of one side. If the area of a square is 50 square inches, what is the length of one side? Round your answer to the nearest thousandth and verify your solution(s).

$A = s^2$

$\sqrt{50} = \sqrt{s^2}$

$\sqrt{25 \cdot 2} = |s|$

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

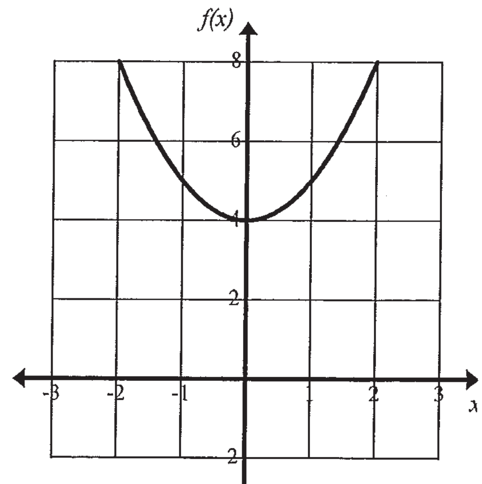
But length is positive

$\boxed{s \approx 7.071 \text{ in}}$

$(7.071)^2 = 50$

$49.999 \approx 50$ ✓

28. The function $f(x) = x^2 + 4$ has no x-intercepts, as shown in the graph to the right. Use algebra to show that no *real roots* exist for this function.



$x^2 + 4 = 0$

$\sqrt{x^2} = \sqrt{-4}$

$|x| = 2i$

$x = 2i$ or $x = -2i$

Both roots are imaginary

Section 5.2H