Worksheet 3B

Simplify the following over the real numbers.

1. $\sqrt{4x^2}$  
2. $\sqrt{-9x^2}$  
3. $\sqrt{x^2 - 16}$  
4. $\sqrt{x^2 + 4x + 4}$

5. $\sqrt{x^2 - 8x + 16}$  
6. $\frac{3}{27}x^3$  
7. $\sqrt[3]{-64x^3}$  
8. $\sqrt[3]{(x + 1)^3}$

9. $\frac{3}{2}(x - 5)^3$  
10. $\frac{4}{3}(x + 2)^4$

Tell whether the following are true or false for all real values of the variable. If false give a counterexample.

11. $\sqrt{w^2} = |w|$  
12. $\sqrt{y^4} = y^2$  
13. $\sqrt[3]{k^3} = |k|$  
14. $\sqrt[4]{h^4} = h$  
15. $\sqrt[5]{m^5} = m$  
16. $\sqrt[3]{x}$ is always a real number

17. $\sqrt[3]{x}$ is always a real number  
18. $\sqrt{x + 1}$ is always a real number

19. $\sqrt[3]{x + 1}$ is always a real number  
20. $\sqrt{x^2 + 1}$ is always a real number

21. $\sqrt[4]{x^2 + 1}$ is always a real number  
22. $\sqrt[5]{x}$ is always a real number

For what values of $x$ does each expression represent a real number?

23. $\sqrt{x + 1}$  
24. $\sqrt{x - 1}$  
25. $\sqrt[3]{x - 1}$

26. $\sqrt{4 - x}$  
27. $\sqrt[3]{4 - x^2}$  
28. $\sqrt{7 + x}$

Select the correct multiple choice response:

29. Which of the following conclusions is true about the statement below?

$$\sqrt{x^2 + y^2} = x + y$$

A. The statement is always true  
B. The statement is never true

C. The statement is true when $x = 0$ and $y = 0$  
D. The statement is true when $x > 0$ and $y > 0$

30. Which of the following conclusions is true about the statement below?

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

A. The statement is always true  
B. The statement is never true

C. The statement is true when $x = 0$  
D. The statement is true when $x$ is negative
Worksheet 3B (cont)

31. Simplify: \( \sqrt{x^2 + 6x + 9} \)
   
   A. \( x + 3 \)  
   B. \( |x + 3| \)  
   C. The statement is true when \( x = 0 \)  
   D. The statement is true when \( x \) is negative

32. Which of the following conclusions is true about the statement below?
   \( \sqrt{x} = x^2 \)
   
   A. The statement is always true  
   B. The statement is never true  
   C. The statement is true when \( x = 0 \)  
   D. The statement is true when \( x \) is positive

33. Which of the following conclusions is true about the statement below?
   \( \sqrt{x} = -8 \)
   
   A. The statement is true when \( x = 64 \)  
   B. The statement is true when \( x = -64 \)  
   C. The statement is true when \( x = 64 \) or \( x = -64 \)  
   D. The statement is never true

34. Which of the following conclusions is true about the statement below?
   \( \sqrt[3]{x} = -5 \)
   
   A. The statement is true when \( x = 125 \)  
   B. The statement is true when \( x = -125 \)  
   C. The statement is true when \( x = 125 \) or \( x = -125 \)  
   D. The statement is never true

35. If \( x \) is a real number, which best describes the values of \( x \) for which the inequality \( \sqrt{x} > 0 \) is true?
   
   A. all \( x > 0 \)  
   B. all \( x \geq 0 \)  
   C. all values of \( x \)  
   D. no values of \( x \)

36. Which statement is true regarding \( \sqrt{x} \)
   
   A. For all values of \( x \), \( \sqrt{x} \) will have one real value
   B. For all values of \( x \), \( \sqrt{x} \) will have two real values
   C. For all positive values of \( x \), \( \sqrt{x} \) will have one real value
   D. For all positive values of \( x \), \( \sqrt{x} \) will have two real values

37. Which statement is true regarding \( \sqrt[3]{x} \)
   
   A. For all values of \( x \), \( \sqrt[3]{x} \) will have one real value
   B. For all values of \( x \), \( \sqrt[3]{x} \) will have two real values
   C. For all negative values of \( x \), \( \sqrt[3]{x} \) will have no real values
   D. \( \sqrt[3]{x} \) will have one real value only when \( x = 0 \)