Lecture 7.1 to 7.3

1. What number is equal to $\sqrt{9}$? $3$

2. Find all real square roots of $25$ $5$

\[
\sqrt{\frac{25}{49}} = \frac{5}{7}
\]
Be sure to write your answer in simplest form.

4. Evaluate the following.
\[
\begin{align*}
-\sqrt{49} &= -7 \\
\sqrt{-36} &= \text{Not Real}
\end{align*}
\]

5. Simplify.
\[
y^\frac{30}{2} = y^{15}, \quad 2^{\frac{1}{2}} = 2^{\frac{1}{2}}
\]
Assume that the variable represents a positive real number.

PEMDAS
Radicals=parenthesis
\[ \sqrt[4]{y^8} = \sqrt[4]{y^4 \cdot y^4} = 2y^2 \]
Assume that the variable \( y \) represents a positive real number.

7. Simplify each expression.
Assume that the variables represent any real numbers.
\[ \sqrt[3]{x^9} = x^3 \]
\[ \sqrt[12]{z^4} = z^{\frac{4}{12}} = z^{\frac{1}{3}} \]

8. Find the value of \( \frac{7}{6} \).
\[ \left( \frac{2^3}{2^3} \right)^{\frac{1}{3}} = 2^{\frac{3}{3}} = 2 \]
\[ \sqrt[3]{a^6} = (a^2)^{\frac{3}{2}} = a^{\frac{3}{2}} \]
\[ \left( \frac{2^3}{2^3} \right)^{\frac{1}{3}} = 2^{\frac{3}{3}} = 2 \]
\[ \sqrt[3]{a^6} = (a^2)^{\frac{3}{2}} = a^{\frac{3}{2}} \]

9. Evaluate the following.
(a) \[ \sqrt[3]{-81} = -3 \]
(b) \[ \sqrt[3]{-27} = -3 \]
\[ (-81)^{\frac{1}{3}} \text{ is not real} \]
\[ (-27)^{\frac{1}{3}} = -3 \]
\[ \frac{18}{2} = 9 \]
\[ \frac{14}{2} = 7 \]

10. Simplify.
\[ \sqrt[3]{\frac{81}{16}} = \frac{3}{2} \]
Be sure to write your answer in lowest terms.

11. Simplify.
\[ \sqrt[3]{625} = \sqrt[3]{5^5} = 5 \]
Assume that the variable represents a positive real number.

12. Simplify each radical expression as much as possible.
Assume that the variables represent any real numbers.
(a) \[ \sqrt[3]{y + 9} \]
(b) \[ \sqrt[3]{z^4} = z^{\frac{4}{3}} \]
special problem...
if radical is even/ you get absolute value in answer
\[ \left( \frac{2^3}{2^3} \right)^{\frac{1}{3}} = 2^{\frac{3}{3}} = 2 \]
\[ \sqrt[3]{a^6} = (a^2)^{\frac{3}{2}} = a^{\frac{3}{2}} \]

13. Find the domain of the function.
\[ g(x) = \sqrt{x - 7} \]
Write your answer using interval notation.
\[ x - 7 \geq 0 \quad [7, \infty) \]
\[ x \geq 7 \]

14. Find the domain of the function.
\[ v(x) = \sqrt{-x + 2} \]
Write your answer using interval notation.
\[ -x + 5 \geq 0 \quad (-\infty, 5] \]
\[ 5 \geq x \]

15. Find the domains of the functions \( f \) and \( g \).
\[ f(x) = \sqrt{x - 7} \quad (7, \infty) \]
\[ g(x) = \sqrt{2x + 4} \quad (-\infty, \infty) \]
Write your answers using interval notation.
Cube roots...no problem!
\[ \sqrt{75} = \sqrt{25 \cdot 3} = 5\sqrt{3} \]

17. Simplify.
\[ \sqrt{126} = \sqrt{6 \cdot 21} = 3\sqrt{14} \]
\[ \sqrt{8} = \sqrt{2^3} = 2\sqrt{2} \]
\[ \sqrt{16} = 4 \]
\[ \sqrt{8} = 2\sqrt{2} \]
\[ \sqrt{12} = 2\sqrt{3} \]
Assume that the variable \( y \) represents a positive real number.

\[ \sqrt{75y^{10}} = \sqrt{25y^{10} \cdot 3} = 5y^5 \sqrt{3} \]
Assume that the variable \( y \) represents a positive real number.

\[ \sqrt{15} = \sqrt{3 \cdot 5} \]
Assume that the variable \( y \) represents a positive real number.

20. Simplify.
\[ \sqrt{20y^{19}} = \sqrt{4 \cdot 5y^{19}} = 2y^9 \sqrt{5y} \]
Assume that the variable \( y \) represents a positive real number.

\[ \sqrt{20 + 5^2} = \sqrt{25 + 5^2} = \sqrt{25y} \]
Assume that all variables represent positive real numbers.

22. Write the following in simplified radical form.
\[ \sqrt{22} = \sqrt{2 \cdot 11} = \sqrt{2} \sqrt{11} \]

23. Write the following in simplified radical form.
\[ \sqrt{11 + 5} = \sqrt{16} = 4 \]
\[ \sqrt{2} \sqrt{2} \]
Assume that the variable \( y \) represents a positive real number.

24. Write the following in simplified radical form.
\[ \sqrt{1600} = \sqrt{16 \cdot 100} = \sqrt{16} \sqrt{100} = 4 \cdot 10 = 40 \]
\[ \sqrt{1600} = \sqrt{16 \cdot 100} = \sqrt{16} \sqrt{100} = 4 \cdot 10 = 40 \]
Assume that the variable \( y \) represents a positive real number.

25. Write the following expression in simplified radical form.
\[ \sqrt{81y^2} = \sqrt{3^4 \cdot y^2} \]
Assume that all of the variables in the expression represent positive real numbers.
1. Write the following as an exponential expression.

$$\sqrt[3]{27} = \left(27^\frac{1}{3}\right)^{\frac{1}{2}} = \sqrt[3]{27}$$

2. Evaluate.

$$\frac{1}{81} = \frac{3}{3} \cdot 3 \cdot 3 = 27$$

$$\frac{1}{125} = \frac{5}{5} = 5$$

3. Evaluate the following.

(a) $$(-16)^\frac{1}{4} =$$

(b) $$(-8)^\frac{1}{2} =$$

4. Simplify.

$$\frac{16^2}{2^4} = \left(2^4\right)^{\frac{3}{2}} = 2^6 = 64$$

$$\frac{16}{(3/2)^2} = 16^2 / (3/2)^2 = 64$$

5. Simplify. Write your answers without exponents.

$$\frac{1/25}{(-3/2)^2} = \frac{1}{5^2} = \frac{1}{5}$$

$$\frac{(2^3)^{-\frac{3}{2}}}{2^{-4}} = 2^{-4}$$


$$\frac{2^3}{2^2} = 2^\frac{3}{2} = 2^{1/2} = \sqrt{2}$$

Assume the variable represents a positive real number.

$$u^a \cdot u^b = u^{a+b}$$

7. Simplify.

$$\frac{3^7}{3^5} + 2 \cdot 5 - \frac{21 + 10}{35} = \frac{3^2 + 2}{35} = \frac{9 + 2}{35} = \frac{11}{35}$$

Write your answer using only a positive exponent. Assume the variable represents a positive real number.

$$\frac{a^b}{a^c} = a^{b-c}$$

$$\frac{-a}{b} = \frac{1}{\sqrt{a^2b}}$$
8. Simplify the expression.
\[
\frac{\frac{1}{y^3}}{\frac{1}{y^4}} = y^{\frac{1}{y^3} \cdot y^4 - \frac{1}{y^4}} = y^{\frac{1}{3} + \frac{1}{2} - \frac{1}{4}} = y^{\frac{5}{6}}
\]
Write your answer using only positive exponents. Assume that all variables are positive real numbers.

\[
\left( \frac{7}{\sqrt[10]{10}} \right)^5 = y^{3.5}
\]
Write your answer without parentheses. Assume that the variable represents a positive real number.

10. Simplify the expression.
\[
\left( \frac{3^5 \cdot b^3}{c^5 \cdot b^3} \right)^{\frac{1}{2}} = c^{-\frac{5}{2}} \cdot b^\frac{3}{2} = \frac{1}{c^{\frac{5}{2}}} 
\]
Write your answer without using negative exponents. Assume that all variables are positive real numbers.

1. Simplify.
\[9\sqrt{11} + 5\sqrt{11} = 12\sqrt{11}\]

2. Simplify.
\[\sqrt{63} + 3\sqrt{7} = 3\sqrt{7} + 6\sqrt{7} = 9\sqrt{7}\]

\[4\sqrt{5} + 5\sqrt{45} - \sqrt{20} = 5\sqrt{5} + 5\sqrt{5} - 2\sqrt{5} = 8\sqrt{5}\]

4. Simplify.
\[\sqrt{75}w - \sqrt{12}w = \sqrt{3}w\]
Assume that the variable represents a positive real number.
5. Simplify.
\[ 6x^2 \sqrt{12x} - \sqrt{18x^3} \]
Assume that the variable represents a positive real number.

6. Simplify as much as possible.
\[ x\sqrt{75u^2} - 2u^2 \sqrt{3ux^2} \]
Assume that all variables represent positive real numbers.

7. Simplify.
\[ -\frac{\sqrt{54}}{2} - 4\sqrt{15} \]

8. Simplify.
\[ -\sqrt[6]{54x^{14}} - 3\sqrt[6]{16x^{14}} \]
Assume that the variable represents a positive real number.

\[ \sqrt{7} \cdot \sqrt{3} \]

10. Simplify.
\[ \sqrt{6} \cdot \sqrt{12} \]

11. Simplify.
\[ \sqrt{60} \times 2 \sqrt{20} \]

12. Simplify.
\[ \sqrt{7z} \cdot \sqrt{3z} \]
Assume that the variable represents a positive real number.

\[ \sqrt{3c^2} \cdot \sqrt{6c^2} \]
Assume that the variable represents a positive real number.

\[ \sqrt{15y^6x^2} \cdot \sqrt{5y^3} \cdot \sqrt{x^3} \]
Assume that all variables represent positive real numbers.
15. Simplify.
\[ \sqrt{4} \cdot \sqrt{20} = \sqrt{80} = 2\sqrt{5} \]

\[ \sqrt{4w^5} \cdot \sqrt{20w^3} = \sqrt{80w^8} = 2\sqrt{5w^4} \]
Assume that the variable represents a positive real number.

17. Multiply.
\[ \sqrt{5} \left( \sqrt{6} - 8 \right) = \sqrt{30} - 8\sqrt{5} \]
Simplify your answer as much as possible.

18. Multiply.
\[ \sqrt{5} \left( \sqrt{7} - 3 \sqrt{10} \right) \]
Simplify your answer as much as possible.

19. Multiply.
\[ (3\sqrt{6} + 1)(5 + 4\sqrt{10}) \]
Simplify your answer as much as possible.

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