Notes for R.7 Radical Expressions (pp. 65 – 72)

Name:
Date:
Instructor:

I. Radical Notation and Simplifying Radicals (pp. 65 – 57)

Recall: $a^{\frac{1}{n}}$ notation from R.6.

Def. $a^{\frac{1}{n}} = \sqrt[n]{a}$ --(a is called the *radicand* = expression under the radical)
(n is called the *index* = *root*)
$\sqrt{a}$, when n is even and a is *positive*, is called the _____
$-\sqrt{a}$ is the _____

Ex. $\sqrt[2]{169} =$

Ex. $\sqrt[3]{-64} =$

Ex. $-\sqrt[5]{243} =$

$\sqrt[even]{negative\ number}$ does not have a real number solution because _____
_____

Rational Exponents $\rightarrow$ Radicals:

Rewrite $a^{\frac{m}{n}}$ as $\left(\sqrt[n]{a}\right)^m$ or $\sqrt[n]{a^m}$, where m and n are integers.

Ex. $81^{\frac{3}{4}} =$

Ex. $-125^{\frac{2}{3}} =$

Ex. $\left(-125\right)^{\frac{2}{3}} =$

* Note the difference the ( ) make in the two examples above. The exponent applies for what it just in front of it- a value of 125 or the).

Ex. $5x^{\frac{3}{4}} =$

Ex. $\left(x+2y\right)^{\frac{2}{3}} =$

* Note that you cannot distribute an exponent over a sum or difference.

Radicals $\rightarrow$ Rational Exponents:

Def. $\sqrt{a} = \sqrt[2]{a^1} = a^{\frac{power\,1}{index\,2}}$; $\sqrt[n]{a^n} =$ $|a|$ when n is even; $\sqrt[n]{a^n} = a$ when n is odd.

Ex. $-5\sqrt{y^3} =$

Ex. $2\sqrt[3]{a+b^3}$ =

Simplifying Radicals: Use absolute value notation when simplifying and even radical and exponent. $\sqrt[n]{a^n} = |a|$ when *n* is _____ and $\sqrt[n]{a^n} = a$ when *n* is _____.

Ex. $\sqrt{x^6}$ =

Summary of Properties for Radicals: (Examples, p. 68)

1. Product Rule: $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ (Indexes are the same)
2. Quotient Rule: $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$ (Indexes are the same)
3. Power Rule: $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$

Summary of Simplified Radicals:

1. The radicand has no factor _____.
2. The radicand has no _____.
3. No denominator has _____.
4. Exponents in the radicand and the index have no _____.
5. All operations have been performed.

Ex. $\sqrt[3]{270}$ =

Ex. $\sqrt[4]{16x^7y^5z^3}$ =

Ex. $\sqrt{24a^2b^3c^5}$ =

* Hint for simplifying: Factor the "smart way" when simplifying a number—use a perfect square (or cube, etc) as a factor. Ex. 24 = 4 * 6 (smart way), rather than 2 * 12 or 3 * 8 (none of those factors is a perfect square).

II. Operations with Radicals (pp.69 – 71)

Like radicals are ones with the same _____ and the same _____. Use the distributive property to factor out the common radical and simplify (combine) the coefficients.

Recall: 2x + 3x = x(2 + 3) = x * 5 or 5x

Likewise: $2\sqrt{11} + 3\sqrt{11} = \sqrt{11}(2 + 3) = \sqrt{11} * 5$ or $5\sqrt{11}$

Ex. $6\sqrt[3]{2xy} + 4\sqrt[3]{2xy}$ =

Ex. $6\sqrt[3]{2xy} - 4\sqrt[3]{2xy}$ =

Ex. $\sqrt{75a^3b} + \sqrt{12ab} =$

Multiply two radical expressions can often be done by using _____.

Ex. $\left(7+\sqrt{3}\right)\left(5-\sqrt{3}\right) =$

Ex. $\left(\sqrt{6}-4\right)\left(\sqrt{6}+4\right) =$

III. Rationalizing Denominators (pp. 71 – 72)

Radicals that are in a division problem cannot _____or _____.

We can rationalize the denominator by multiplying by _____ _____.

* When a denominator is a radical, it's similar to a fraction being "over-reduced". We have to multiply by a form of 1 to bring the number out from under the radical sign.

Rationalizing the denominator when the denominator is a monomial:

Ex. $\sqrt{\frac{2x}{5}} =$

Ex. $\sqrt[3]{\frac{a^2b^4}{9abc}} =$

Ex. $\frac{\sqrt[4]{xy} \bullet \sqrt[4]{x^2y}}{\sqrt[4]{xy^3}} =$

Rationalizing the denominator that is a sum or difference:
Use the _____ to make a difference of two squares.

Ex. $\frac{4}{\sqrt{6}-3} =$

Ex. $\frac{p}{\sqrt{p}+2} =$

Calculator Hints:
1. Use **2nd x²** to enter a square root. Close the parentheses as needed.
2. Use **MATH #4** to enter a cube root. Close the parentheses as needed.
3. Use **(the index) MATH #5** to enter any other root. Open and close parentheses as needed. Ex. $\sqrt[5]{100,000}$ is entered as " 5 MATH#5: $\sqrt[x]{}$ (100000), then Enter to get 10.

Assignments:
Text: pp. 73 – 74 #1 – 9 odd, 15 –49 odd, 59 – 63, 67, 71, 73, 83, 87

"A Review of Algebra": pp. 170 – 171 #1 – 45 odd