R2 Day 2

Friday, February 17, 2017 9:28 AM

$4^{1/2} = \sqrt{4}$

R2 – Radicals and Exponential form

Side by Side

The Rules

a. $\sqrt[n]{x^m} = (x^m)^{1/n} = x^{\frac{m}{n}}$

b. $\sqrt[n]{x^m y^m} = (x^m y^m)^{1/n}$
$= ((xy)^m)^{1/n} = (xy)^{m/n}$

c. $\sqrt[n]{\frac{x}{y}} = \left(\frac{x}{y}\right)^{1/n} = \frac{x^{1/n}}{y^{1/n}}$

d. $x^{\frac{a}{b}} = (x^a)^{1/b} = (x^{1/b})^a$
$= \sqrt[b]{x^a}$

Example:

a. $\sqrt[5]{x^2} = (x^2)^{1/5} = x^{2/5}$

b. $\sqrt[4]{x^2 y^3} = (x^2 y^3)^{1/4}$
$= x^{2/4} y^{3/4} = x^{1/2} y^{3/4}$

d. $\sqrt[3]{\frac{x}{y^2}} = \left(\frac{x}{y^2}\right)^{1/3}$
$= \frac{x^{1/3}}{y^{2/3}}$

d. $16^{\frac{3}{4}}$
$= (16^{1/4})^3$
$= 2^3$
$= 8$

I. Evaluate over the real numbers:

1. $36^{\frac{1}{2}} = 6$

2. $27^{\frac{1}{3}} = 3$

3. $\sqrt[3]{-27}$ -3

4. $\sqrt[4]{-16}$ undefined

5. $8^{\frac{2}{3}} = (8^{1/3})^2$
$= 4$

6. $\sqrt[4]{3^{12}} = (3^{12})^{1/4}$
$= 27$

7. $\sqrt[4]{625} = 5$

8. $(-49)^{\frac{1}{2}}$ undefined

9. $-49^{\frac{1}{2}} = -1 \cdot 49^{1/2}$
-7

II: A little harder:

10. $\sqrt[3]{64} = 4$

11. $64^{-\frac{4}{3}}$
$\left(\left((64)^{1/3}\right)^4\right)^{-1}$
$= \frac{1}{256}$

12. $32^{-\frac{7}{5}}$
$\left(\left(32^{1/5}\right)^7\right)^{-1}$
$= \frac{1}{128}$

$2^3=8$ $3^3=27$ $\cancel{4^3=64}$ $2^4=16$ $\cancel{3^4=81}$

III: Simplifying Radicals

13. $\sqrt{48}$

$\sqrt{16\cdot 3}$

$=4\sqrt{3}$

14. $\sqrt[3]{-54}$

$\sqrt[3]{-27\cdot 2}$

$=-3\sqrt[3]{2}$

15. $\sqrt[4]{48}$

$\sqrt[4]{16\cdot 3}$

$=2\sqrt[4]{3}$

16. $\sqrt{48x^6y^{16}z^7} = \left(48x^6y^{16}z^7\right)^{1/2}$

$=4\sqrt{3x^6\cdot y^{16}z^6\cdot z}$

$=4\sqrt{3x^3x^3y^8y^8z^3z^3z}$

$=4x^3y^8z^3\sqrt{3z}$

17. $\sqrt[3]{24a^9b^{10}c^{17}}$

$\sqrt[3]{8\cdot 3a^9b^9\cdot b\cdot c^{15}\cdot c^2}$

$=2a^3b^3c^5\sqrt[3]{3bc^2}$

18. $\sqrt[3]{32}+\sqrt[3]{81}$

19. $\sqrt[3]{16}+\sqrt[5]{64}+\sqrt[5]{2}-5\sqrt[3]{54}$

IV: Rationalizing

20. $\sqrt{\frac{7x^2}{3}} = \frac{\sqrt{7x^2}}{\sqrt{3}} = \frac{x\sqrt{7}}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}$

$=\frac{x\sqrt{21}}{3}$

21. $\frac{30}{\sqrt[4]{2x}}$

$\frac{30}{(2x)^{1/4}}\cdot\frac{(2x)^{3/4}}{(2x)^{3/4}}$

$=\frac{30(2x)^{3/4}}{2x}$

$=\boxed{\frac{15(2x)^{3/4}}{x}} = \frac{15\sqrt[4]{2^3x^3}}{x}$

18. $\frac{8}{\sqrt{3}-\sqrt{5}}\cdot\frac{\sqrt{3}+\sqrt{5}}{\sqrt{3}+\sqrt{5}}$

$\frac{8\sqrt{3}+8\sqrt{5}}{3-5} = \frac{8\sqrt{3}+8\sqrt{5}}{-2}$

$=-4\sqrt{3}-4\sqrt{5}$

$3 \quad -5$

$= -4\sqrt{3} - 4\sqrt{5}$