Section 8.6 - Radical Exp. and Rational Exponents (DAY 2)

Focus: simplify

1) $\sqrt[4]{81x^{12}} = 3|x^3|$

2) $\sqrt[4]{\frac{16x^8}{5}} = \frac{\sqrt[4]{16x^8}}{\sqrt[4]{5}} = \frac{2x^2}{\sqrt[4]{5}} \cdot \frac{\sqrt[4]{125}}{\sqrt[4]{125}} = \frac{2x^2\sqrt[4]{125}}{\sqrt[4]{625}}$

$= \frac{2x^2\sqrt[4]{125}}{5}$

3) $(-32)^{3/5} = (\sqrt[5]{-32})^3 = (-2)^3 = -8$

4) $(125x^3y^6z^{12})^{2/3} = (\sqrt[3]{125x^3y^6z^{12}})^2 = (5xy^2z^4)^2$

$= 25x^2y^4z^8$

5) $\sqrt[4]{(-3)^4} = (-3)^1 \rightarrow |-3| = 3$

6) $\sqrt[3]{(x-5)^3} = x-5$

7) $\sqrt[6]{(2-x)^6} = (2-x)^1 \rightarrow |2-x| = 2-x$

8) $\sqrt[4]{162x^5y^6z^{14}} = 3x|yz^3|\sqrt[4]{2xy^2z^2}$

81 | 2

9 | 9

3 3 3 3

* Note: $10^{2/3} = (\sqrt[3]{10})^2$ or $\sqrt[3]{10^2}$

Properties of Rational Exponents

1) $a^m \cdot a^n = a^{m+n}$ ex: $12^{1/2} \cdot 12^{3/2} = 12^{4/2} = 12^2 = 144$

2) $\frac{a^m}{a^n} = a^{m-n}$ ex: $\frac{125^{2/3}}{125^{1/3}} = 125^{1/3} = \sqrt[3]{125} = 5$

3) $(a^m)^n = a^{m \cdot n}$ ex: $(8^{2/3})^2 = 8^{4/3} = (\sqrt[3]{8})^4 = 2^4 = 16$

4) $(ab)^m = a^m b^m$ ex: $(16 \cdot 25)^{1/2} = 16^{1/2} \cdot 25^{1/2} = \sqrt{16} \cdot \sqrt{25}$
$= 4 \cdot 5 = 20$

5) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ ex: $\left(\frac{16}{81}\right)^{1/4} = \frac{16^{1/4}}{81^{1/4}} = \frac{\sqrt[4]{16}}{\sqrt[4]{81}} = \frac{2}{3}$

EXAMPLES:

1) $36^{3/8} \cdot 36^{1/8} = 36^{4/8} = 36^{1/2} = \sqrt{36} = 6$

2) $(-8)^{-1/3} = \sqrt[3]{\frac{1}{-8}} = \frac{1}{-2}$

3) $\frac{5^{9/4}}{5^{1/4}} = 5^{8/4} = 5^2 = 25$

4) $(64^{1/2})^{1/3} = (\sqrt{64})^{1/3} = \sqrt[3]{8} = 2$

5) $7^{1/4} \cdot 7^{-3/4} = 7^{-2/4} = 7^{-1/2} = \frac{1}{\sqrt{7}} = \frac{\sqrt{7}}{7}$

6) $(27 \cdot 125)^{1/3} = \sqrt[3]{27} \cdot \sqrt[3]{125} = 3 \cdot 5 = 15$

7) $\left(\frac{5^4}{16}\right)^{1/4} = \frac{5}{16^{1/4}} = \frac{5}{\sqrt[4]{16}} = \frac{5}{2}$

8) $\left(\frac{144}{36}\right)^{-1/2} = \left(\frac{36}{144}\right)^{1/2} = \frac{\sqrt{36}}{\sqrt{144}} = \frac{6}{12} = \frac{1}{2}$

9) $(81x^2)^{1/2} = \sqrt{81x^2}$
$= 9|x|$

10) $(343a^3)^{-5/3}$
$= \left(\sqrt[3]{343a^3}\right)^5$
$= (7a)^5$
$= 16807a^5$
$= \frac{1}{16807a^5}$