Quiz 7.1

1. (2 point) Simplify:

$$-\sqrt[5]{-243}$$

2. (2 point) Evaluate:

$$8^{\frac{4}{3}}$$

3. (2 point) Rewrite the radical with a rational exponent.

$$\left(\sqrt[5]{3x}\right)^2$$

7.2 Simplify Expressions Using the Laws of Exponents

Just a reminder. (You can find this list on page 542)

Rules

$a^0 = 1 \quad \text{if } a \neq 0$ $2x^0 = 2$

$a^{-n} = \frac{1}{a^n} \quad \text{or} \quad \frac{1}{a^{-n}} = a^n \quad \text{if } a \neq 0$

$a^m \cdot a^n = a^{m+n}$ $2^{-2} = \frac{1}{4}$ $2^2 = 4$

$\frac{a^m}{a^n} = a^{m-n} \quad \text{if } a \neq 0$ $2^{-3} = \frac{1}{8}$ $2^3 = 8$

$(a^m)^n = a^{m \cdot n}$

$(a \cdot b)^n = a^n \cdot b^n$

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} \quad \text{if } b \neq 0$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n \quad \text{if } a \neq 0,\ b \neq 0$

63) $\left(\sqrt[5]{3x}\right)^2$

$\left((3x)^{\frac{1}{5}}\right)^2 = (3x)^{\frac{1}{5}}(3x)^{\frac{1}{5}}$

$(3x)^{\frac{2}{5}}$

After you simplify you should have:

- Only positive exponents.
- Each base only occurring once.
- Have no parentheses in the expression.
- No powers written to powers.

Simplify each of the following:

$27^{\frac{3}{2}} \cdot 27^{\frac{5}{6}}$

$27^{8/6} = 27^{4/3}$

$\frac{8^{\frac{1}{3}}}{8^{\frac{5}{3}}} = 8^{-4/3} = \frac{1}{8^{4/3}}$

You Try

$5^{\frac{3}{4}} \cdot 5^{\frac{1}{6}}$

$\frac{32^{\frac{6}{5}}}{32^{\frac{3}{5}}}$

Simplify each of the following:

mult

$\left(36^{\frac{2}{5}}\right)^{\frac{5}{4}} = 36^{1/2} = 6$

$\left(x^{\frac{1}{2}} \cdot y^{\frac{2}{3}}\right)^{\frac{3}{2}} = x^{\frac{3}{4}} y$

You Try

$\left(100^{\frac{3}{8}}\right)^{\frac{4}{3}}$

$\left(a^{\frac{3}{2}} \cdot b^{\frac{5}{4}}\right)^{\frac{2}{3}}$

Simplify the following:

$$\left(x^{\frac{2}{3}}y^{-1}\right)\cdot\left(x^{-1}y^{\frac{1}{2}}\right)^{\frac{2}{3}}$$

$= \left(x^{\frac{2}{3}}y^{-1}\right)\cdot\left(x^{-\frac{2}{3}}y^{\frac{1}{3}}\right)$

$= x^{0}y^{-\frac{2}{3}}$

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

Simplify the following:

$$\left(\frac{9xy^{\frac{4}{3}}}{x^{\frac{5}{6}}y^{-\frac{2}{3}}}\right)^{\frac{1}{2}} = \frac{9^{\frac{1}{2}}x^{\frac{1}{2}}y^{\frac{2}{3}}}{x^{\frac{5}{12}}y^{-\frac{1}{3}}} = \frac{3x^{\frac{1}{12}}y}{1}$$

$\frac{2}{3} + \frac{1}{3}$

You Try

$$\left(\frac{25x^{\frac{1}{2}}y^{\frac{3}{4}}}{x^{-\frac{3}{4}}y}\right)^{\frac{1}{2}}$$

Use rational exponents to simplify the radicals.

$\sqrt[8]{16^4}$

$16^{\frac{1}{2}} = 4$

$\sqrt[3]{64x^6y^3}$

$4x^2y$

Use rational exponents to simplify the radicals.

$\frac{\sqrt{x}}{\sqrt[3]{x^2}} = \frac{x^{\frac{1}{2}}}{x^{\frac{2}{3}}}$

$x^{-\frac{1}{6}} = \frac{1}{x^{\frac{1}{6}}}$

$\sqrt{\sqrt[3]{z}}$

$\sqrt{(z)^{1/3}}$

$((z)^{\frac{1}{3}})^{\frac{1}{2}} = z^{\frac{1}{6}}$

You try

$\sqrt[10]{36^5}$

$\sqrt[4]{16a^8b^{12}}$

$\frac{\sqrt[3]{x^2}}{\sqrt[4]{x}}$

$\sqrt[4]{\sqrt[3]{a^2}}$

13) $(25^{\frac{3}{4}} \cdot 4^{-\frac{3}{4}})^2$ $\quad 25 \quad 5^2 \quad 5$

$\frac{3}{4} \cdot \frac{2}{1}$

$= 25^{\frac{3}{2}} \cdot 4^{-\frac{3}{2}}$

$= \frac{25^{\frac{3}{2}}}{4^{\frac{3}{2}}} = \frac{\sqrt{25^3}}{\sqrt{4^3}} = \frac{125}{8}$

45) $\frac{\sqrt{6}}{\sqrt[4]{36}} = \left(\frac{6^{1/2}}{36^{1/4}}\right)^2 = \frac{6}{36^{1/2}} = \frac{6}{\sqrt{36}} = \frac{6}{6}$

Nak conjecture — Wrong!! Ha! Ha! $= 1$

$\sqrt[4]{36} = \sqrt{36} \cdot \sqrt{36}$

$36^{\frac{1}{4}} = 36^{\frac{1}{2}} \cdot 36^{\frac{1}{2}} = 36^1$

$\frac{\sqrt{6}}{\sqrt[4]{36}} = \frac{6^{\frac{1}{2}}}{36^{\frac{1}{4}}} = \frac{6^{\frac{1}{2}}}{(6^2)^{1/4}} = \frac{6^{1/2}}{6^{1/2}}$