

(Fractions)



Sept. 3rd, 2008

1.2 Rational Exponents

Consider $(9^{1/2})^2 = 9$

but $3^2 = 9$

$\therefore (9^{1/2})^2 = 3^2$

$\sqrt{(9^{1/2})^2} = \sqrt{3^2}$

$9^{1/2} = 3$

but $\sqrt{9} = 3$

$\therefore 9^{1/2} = \sqrt{9}$

√ radical sign

$\therefore x^{n/m} = \sqrt[m]{x^n} = (\sqrt[m]{x})^n$

↑
exponential form

↑
radical form

Real Numbers (\mathbb{R})

(\mathbb{Q}) Rational #
 $\frac{a}{b}$ $a, b \in \mathbb{I}$
 $b \neq 0$

($\bar{\mathbb{Q}}$) Irrational #
 $\pi, \sqrt{7}$

1. Evaluate

a) $81^{1/2}$ - root

$= \sqrt{81}$

$= 9$

b) $27^{1/3}$

$= \sqrt[3]{27}$

$= 3$

c) $64^{1/6}$

$= \sqrt[6]{64}$

$= 2$

$$d) 8^{2/3}$$

$$= \sqrt[3]{8^2} \text{ OR } (\sqrt[3]{8})^2$$

$$= 2^2$$

$$= 4$$

$$f) 81^{-3/4}$$

$$= \left(\frac{1}{81}\right)^{3/4}$$

$$= \left(\sqrt[4]{\frac{1}{81}}\right)^3 = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$$

$$h) 9^{-2.5}$$

$$= 9^{-5/2}$$

$$= \left(\frac{1}{9}\right)^{5/2} \text{ Root}$$

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

$$= \frac{1}{243}$$

$$e) -25^{5/2}$$

$$= -(\sqrt{25})^5$$

$$= -3125$$

$$g) \left(\frac{25}{4}\right)^{-3/2}$$

$$= \left(\frac{4}{25}\right)^{3/2} = \frac{8}{125}$$

$$i) (-8)^{4/3}$$

$$= (-2)^{\textcircled{4}}$$

even
∴ +ve answer
odd
∴ -ve answer

$$= 16$$

2. Rewrite using exponents

$$a) \sqrt[4]{x^{-3}} = x^{-3/4}$$

$$b) (\sqrt[3]{a})^{2/5} = (a^{1/3})^{2/5}$$

$$= a^{2/15}$$

$$c) \sqrt[4]{7^{0.3}} = \sqrt[4]{7^{3/10}}$$

$$= (7^{3/40}) = (7^{3/10})^{1/4}$$

$$= 7^{3/40}$$

$$d) \sqrt[4]{\sqrt[3]{27x^3}}$$

$$= \sqrt[4]{3x^{7/3}}$$

$$= 3^{1/4} x^{7/12}$$

3. Simplify

$$a) (49x^4)^{3/2}$$

$$= 7^3 (x^2)^3$$

$$= 343x^6$$

$$b) \left(\frac{81}{16y^8}\right)^{-1/4}$$

$$= \left(\frac{16y^8}{81}\right)^{1/4}$$

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

September 4th, 2008

1.2 Rational Exponents (Continued)

1. Simplify

$$a) (-d^3)^4 \left(\frac{c}{d}\right)^6$$

$$= d^{12} \cdot \frac{c^6}{d^6}$$

$$= d^6 c^6$$

$$b) \frac{3(ab)^4}{(-a^2)^2}$$

$$= \frac{3a^4b^4}{a^4}$$

$$= 3b^4$$

2. Evaluate

$$a) 27^{2/3} - 81^{3/4}$$

$$= 3^2 - 3^3$$

$$= 9 - 27$$

$$= -18$$

$$b) 81^{1/2} + \sqrt[3]{8} - 32^{4/5} + 16^{3/4}$$

$$= 9 + 2 - 16 + 8$$

$$= 3$$

3. Simplify

$$a) \frac{18y^{4/3}z^{-1/3}}{24y^{-2/3}z}$$

$$= \frac{3y^2z^{-4/3}}{4}$$

$$= \frac{3y^2}{4z^{4/3}}$$

$$b) b^{m-2} \div b^{n+4}$$

$$\text{OR } = b^{m-2-(n+4)}$$

$$= b^{m-2-n-4}$$

$$= b^{m-n-6}$$

$$c) (-4a^{2/4}b^{3/4})^{-2}$$

$$= (16a^{4/4}b^{3/2})^{-1}$$

$$= \frac{1}{16a^{4/4}b^{3/2}}$$

Simplify

$$\frac{(-4a^{2/4}b^{3/4})^{-2}}{(-4a^{2/4}b^{3/4})^{-2}}$$

$$\frac{16a^{4/4}b^{3/2}}{16a^{4/4}b^{3/2}}$$

$$1 = 1$$

$$\left(\frac{a}{b}\right)^{-2} = \left(\frac{b}{a}\right)^2$$

$$\frac{a^2}{b^2} = \frac{b^2}{a^2}$$

$$a^2 \cdot a^2 = b^2 \cdot b^2$$

$$a^4 = b^4$$

Evaluate

$$8 + 21 - 5 + 10 + 10 = 44$$

$$44 - 10 = 34$$

$$81 - 18 = 63$$

$$63 - 18 = 45$$

Simplify

$$a^m \cdot a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

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

$$\frac{18a^{2/3}b^{1/3}}{3a^{1/3}b^{2/3}}$$

$$= \frac{18}{3} \cdot \frac{a^{2/3}}{a^{1/3}} \cdot \frac{b^{1/3}}{b^{2/3}}$$

$$= 6 \cdot a^{2/3-1/3} \cdot b^{1/3-2/3}$$

$$= 6 \cdot a^{1/3} \cdot b^{-1/3}$$

$$= \frac{6a^{1/3}}{b^{1/3}}$$