

## Are there any Homework Questions you would like to see on the board?

pp. 407-409 # 1 - 9, 11, 12

## Today's Learning Goal(s):

By the end of the class, I will be able to:

- Determine the meaning of a power with a rational exponent.
- Evaluate rational exponents.

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9. Evaluate. Leave answers as fractions or integers.

a)  $3^{-2} - 9^{-1}$

$$\begin{aligned} & \rightarrow 3^{-2} - 9^{-1} \\ & = \left(\frac{1}{3}\right)^2 - \left(\frac{1}{9}\right)^1 \\ & = \frac{1}{9} - \frac{1}{9} \\ & = 0 \end{aligned}$$

c)  $8^{-2} + (4^{-1})^2$

$$\begin{aligned} & \rightarrow b) 4^{-2} + 3^0 - 2^{-3} \rightarrow \\ & = \left(\frac{1}{4}\right)^2 + 1 - \left(\frac{1}{2}\right)^3 \\ & = \frac{1}{16} + 1 - \frac{1}{8} \\ & = \frac{1}{16} + \frac{16}{16} - \frac{2}{16} \\ & = \frac{15}{16} \end{aligned}$$

e)  $12(4^0 - 3^{-2})$

$$\begin{aligned} & c) 8^{-2} + (4^{-1})^2 \\ & = \frac{1}{8^2} + 4^{-2} \\ & = \frac{1}{64} + \frac{1}{4^2} \\ & = \frac{1}{64} + \frac{1}{16} \quad \times 4 \\ & = \frac{1}{64} + \frac{4}{64} \\ & = \frac{5}{64} \end{aligned}$$

d)  $\left(\frac{1}{2}\right)^{-1} + \left(\frac{1}{3}\right)^{-1}$

$$\begin{aligned} & = (2)^1 + (3)^1 \\ & = 5 \end{aligned}$$

e)  $\frac{(-2)^1(-2^{-3})}{(-2)^4}$

$$\begin{aligned} & = (-2)^{1+(-3)} - 4 \\ & = (-2)^{-6} \\ & = \left(\frac{1}{-2}\right)^6 \\ & = \frac{1}{64} \end{aligned}$$

f)  $\left(\frac{5^{-2}}{5}\right)^{-1}$

$$\begin{aligned} & = (5^{-2-1})^{-1} \\ & = (5^{-3})^{-1} \\ & = 5^3 \\ & = 125 \end{aligned}$$

Date: Dec. 5/19

Rational Exponent RULES:

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$$

$$\left(a^{\frac{1}{n}}\right)^m$$

$$\left\{ \begin{array}{l} (4)^{-2} \\ \left(-\frac{1}{4}\right)^2 \end{array} \right.$$

Ex. 1: Evaluate each of the following without a calculator

$$\begin{aligned} \text{a) } 25^{\frac{1}{2}} &= \sqrt{25} \\ &= 5 \end{aligned}$$

$$\begin{aligned} \text{b) } 27^{\frac{1}{3}} &= \sqrt[3]{27} \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{c) } 27^{\frac{2}{3}} &= \left(\sqrt[3]{27}\right)^2 \\ &= (3)^2 \\ &= 9 \end{aligned}$$

$$\begin{aligned} \text{d) } (-27)^{\frac{2}{3}} &= \left(\sqrt[3]{-27}\right)^2 \\ &= (-3)^2 \\ &= 9 \end{aligned}$$

$$\begin{aligned} \text{e) } (-27)^{-\frac{2}{3}} &= \left(\sqrt[3]{-27}\right)^{-2} \\ &= \left(-3\right)^{-2} \\ &= \left(\frac{1}{-3}\right)^2 \\ &= \frac{1}{9} \end{aligned}$$

$$\begin{aligned} \text{f) } 32^{0.2} &= 32^{\frac{2}{10}} \\ &= 32^{\frac{1}{5}} \\ &= \sqrt[5]{32} \\ &= 2 \end{aligned}$$

$$\begin{aligned} \text{g) } 256^{0.25} &= 256^{\frac{25}{100}} \\ &= 256^{\frac{1}{4}} \\ &= \sqrt[4]{256} \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{h) } 81^{-0.25} &= 81^{-\frac{1}{4}} \\ &= \left(\frac{1}{81}\right)^{\frac{1}{4}} \\ &= \frac{1}{\sqrt[4]{81}} \\ &= \frac{1}{3} \end{aligned}$$

$$\begin{aligned} \text{i) } -(49)^{0.5} &= -(49)^{\frac{1}{2}} \\ &= -\sqrt{49} \\ &= -7 \end{aligned}$$

$$\begin{aligned} \text{j) } \left(8^{\frac{1}{6}}\right)^7 &= \frac{1}{8^{\frac{1}{6} \cdot 7}} \\ &= \frac{1}{8^{\frac{7}{6}}} \\ &= 8^{\frac{7}{6} + \frac{5}{6}} \\ &= 8^{\frac{12}{6}} \\ &= 8^2 \\ &= 64 \end{aligned}$$

Ex. 2: Write in exponent form. Then evaluate.

$$\begin{aligned} \text{a) } \sqrt[10]{1024} &= 1024^{\frac{1}{10}} \\ &= 2 \end{aligned}$$

$$\begin{aligned} \text{b) } \sqrt[5]{1024} &= 1024^{\frac{1}{5}} \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{c) } \sqrt[3]{-216} &= (-216)^{\frac{1}{3}} \\ &= (-6)^3 \\ &= -216 \end{aligned}$$

$$\begin{aligned} &= 8^{\frac{7}{6} + \frac{5}{6}} \\ &= 8^{\frac{12}{6}} \\ &= 8^2 \\ &= 64 \end{aligned}$$

Ex. 3: If time, do one example from each question in the homework (below).

3b) Use your calculator to find  $0.0625^{\frac{1}{4}}$ 

$$= \sqrt[4]{0.0625}$$

$$\begin{array}{c} x^9 \quad x^7 \quad \wedge \\ \sqrt{x} \quad \sqrt[5]{x} \quad \sqrt[n]{x} \end{array}$$

6e) Write with a single power with a positive exponent

$$\left(10^{\frac{5}{8}}\right)^{-2}$$

$$\begin{aligned} &= 10^{-\frac{10}{8}} \\ &= 10^{-\frac{5}{4}} \end{aligned}$$

7d) Write with a single power with a positive exponent  $4^{0.3} \div 4^{0.8} \times 4^{-0.7}$ 

$$\begin{aligned} &= 4^{0.3 - 0.8 + (-0.7)} \\ &= 4^{-1.2} \\ &= \frac{1}{4^{1.2}} \end{aligned}$$

**Today's Homework:**

**READ** p. 415 **and** **READ** p. 418

pp. 415–417 # 1, 2cef, 3, 6, 7, 9 – 12, 14, 15

p. 419 # 1 – 8

**SWYK Tomorrow**

$$\begin{aligned} 27^{\frac{2}{3}} &\rightarrow (27^2)^{\frac{1}{3}} \\ &= (729)^{\frac{1}{3}} \\ &= \sqrt[3]{729} \\ &= 9 \end{aligned}$$
$$\begin{aligned} &\leftarrow (27^{\frac{1}{3}})^2 \\ &= (\sqrt[3]{27})^2 \\ &= (3)^2 \\ &= 9 \end{aligned}$$

$$\left. \begin{aligned} \frac{1}{3} \times \frac{2}{1} \\ = \frac{2}{3} \end{aligned} \right\} \left( 2 \times \frac{1}{3} \right) = \frac{2}{3}$$