Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

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

a) use the exponent laws to simplify and evaluate expression
b) solve exponential equations by using common bases.

1.5.1: Simplifying and Evaluating Expressions Using the Laws of Exponents

Date: Feb. 14/17

Ex. 1 Evaluate without using a calculator. [You must use the laws of exponents]

a) 3^{-2} b) $\left(\frac{1}{4}\right)^{-2}$ c) $\frac{1}{4^{-2}}$ d) $\left(\frac{3}{4}\right)^{-2}$ e) $\left(-\frac{2}{5}\right)^{-3}$ f) $\left(\frac{81}{16}\right)^{\frac{1}{2}}$ g) $27^{\frac{2}{3}}$ h) $64^{\frac{4}{3}}$ i) $\left(\frac{16}{81}\right)^{\frac{1}{4}}$

$=\left(\frac{1}{3}\right)^2 = \frac{1}{3^2} = \frac{1}{9}$ $=\left(\frac{4}{1}\right)^2 = 16$ $=\frac{1}{\left(\frac{1}{4}\right)^2} = 1 \div \left(\frac{1}{4}\right)^2 = 1 \times \left(\frac{4}{1}\right)^2 = 16$ $=\left(\frac{4}{3}\right)^2 = \frac{16}{9}$ $=\left(\frac{-5}{2}\right)^3 = -\frac{125}{8}$ $=\frac{\sqrt{81}}{\sqrt{16}} = \frac{9}{4}$ $=\left(\sqrt[3]{27}\right)^2 = (3)^2 = 9$ $=\left(\sqrt[3]{64}\right)^4 = 4^4 = 256$ $=\frac{\sqrt[4]{16}}{\sqrt[4]{81}} = \frac{2}{3}$

Ex. 2 Simplify using the laws of exponents.

a) $\sqrt{x^6 y^{12}}$

$=(x^6 y^{12})^{\frac{1}{2}}$

$=(x^6)^{\frac{1}{2}}(y^{12})^{\frac{1}{2}}$

$=x^3 y^6$

b) $x^2 \div x^{\frac{3}{2}}$

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

$=x^{\frac{4}{2}-\frac{3}{2}}$

$=x^{\frac{1}{2}}$

$=\sqrt{x}$

c) $\left(x^{\frac{2}{5}}\right)^{\frac{5}{8}}$

$=x^{\frac{1}{4}}$

d) $\left(\sqrt{81x^{16}y^{100}}\right)\left(2x^{-4}y^3\right)^2$

$=9(x^{16})^{\frac{1}{2}}(y^{100})^{\frac{1}{2}}(2)^2(x^{-4})^2(y^3)^2$

$=9x^8y^{50} \cdot 4x^{-8}y^6$

$=36x^{8+(-8)}y^{50+6}$

$=36y^{56}x^0$

$\frac{-20}{4}$ $\frac{20}{-4}$ $-\frac{20}{4}$

$= -5$ $= -5$ $= -5$

$-\frac{3}{4}x$ $\frac{3}{-4}x$ $-\frac{3}{4}x$

10

$-\frac{3}{-4}x$

Ex. 3

a) Simplify $\frac{a^3b^2c^3}{\sqrt{a^2b^4}}$, and then evaluate for $a=4$, $b=9$, and $c=-3$.

b) Verify your answer by evaluating the expression ***without*** simplifying first.

$$= \frac{a^3b^2c^3}{(a^2b^4)^{\frac{1}{2}}}$$

$$= \frac{a^3b^2c^3}{(a^2)^{\frac{1}{2}}(b^4)^{\frac{1}{2}}}$$

$$= \frac{a^3b^2c^3}{ab^2}$$

$$= a^{3-1}b^{2-2}c^3$$

$$= a^2c^3$$

$$= (4)^2(-3)^3$$

$$= 16(-27)$$

$$= -432$$

$$= \frac{(4)^3(9)^2(-3)^3}{\sqrt{(4)^2(9)^4}}$$

$$= \frac{64(81)(-27)}{\sqrt{16 \cdot 6561}}$$

1.5.2: Solving Exponential Equations Using Common Bases

Date: Feb. 14/17

Ex. 1 Solve each exponential equation by determining a common base.

a) $2^x = 32$

$2^x = 2^5$

$\therefore x = 5$

b) $3^{5x+8} = 27^x$

$3^{5x+8} = (3^3)^x$

$3^{5x+8} = 3^{3x}$

$\therefore 5x+8 = 3x$

$5x - 3x = -8$

$2x = -8$

$x = -4$

c) $3^{2x+5} = 27^{4x}$

$3^{2x+5} = (3^3)^{4x}$

$3^{2x+5} = 3^{12x}$

$\therefore 2x+5 = 12x$

$2x - 12x = -5$

$-10x = -5$

$x = \frac{1}{2}$

d) $4^{5x-1} = 2^{2(x+11)}$ **

$(2^2)^{5x-1} = 2^{2(x+11)}$

$2^{10x-2} = 2^{2x+22}$

$10x - 2 = 2x + 22$

$10x - 2x = 22 + 2$

$8x = 24$

$x = 3$

e) $4^{3x} = 8^{x+1}$

$(2^2)^{3x} = (2^3)^{x+1}$

$2^{6x} = 2^{3x+3}$

$\therefore 6x = 3x + 3$

$6x - 3x = 3$

$3x = 3$

$x = 1$

f) $3(2^{x-1}) = 96$

$\div 3 \quad \div 3$

$2^{x-1} = 32$

$2^{x-1} = 2^5$

$\therefore x - 1 = 5$

$x = 6$

g) $5(3^{x+3}) = 405$

$3^{x+3} = \frac{405}{5}$

$3^{x+3} = 81$

$3^{x+3} = 3^4$

$\therefore x + 3 = 4$

$x = 1$

h) $\sqrt{2} = 4^{x+1}$

$2^{\frac{1}{2}} = (2^2)^{x+1}$

$2^{\frac{1}{2}} = 2^{2x+2}$

$\therefore \frac{1}{2} = 2x + 2$

$\frac{1}{2} - 2 = 2x$

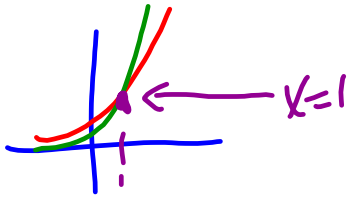
$-\frac{3}{2} = 2x$

$-\frac{3}{4} = x$

i) How could you check your solutions using graphing technology?

Intersection Method

for e) $y_1 = 4^{3x}$ $y_2 = 8^{x+1}$



Review the learning goals. Were we successful today?

Homework: p.387 #1, 2a, 3a, 5, 6
Worksheet 1.5.3

Answer any remaining homework questions
Students ask for "at desk" clarification.

1.5.3 Solving Exponential Equations Using Common Bases

Date: _____

1. Solve each exponential equation by determining a common base.

a) $2^x = 64$ b) $5^{2x+6} = 125$ c) $5^x = \frac{1}{25}$ d) $4^x = \frac{1}{8}$

2. Simplify.

a) $\frac{27^3 \times 9^{-2}}{81}$ b) $\frac{25^{m+3n}}{125^{2m+1}}$

3. Solve.

a) $3(2^x) = 48$ b) $4(7^{2x-1}) = 28$ c) $9^{x+1} = 27^{3x-4}$ d) $2^{2x+4} - 5 = 59$

4. Solve.

a) $2^{x^2+5x} = 64$ b) $(3^{x-3})^x = \frac{1}{9}$ c) $3^{3x+1} = 27(9^x)$ d) $(2^{x+2})(4^{x-1})(8^{2x-3}) = 256^x$

Answers

1a) 6 b) $\frac{-3}{2}$ c) –2 d) $\frac{-3}{2}$ 2a) 3 b) $5^{6n-4m-3}$

3a) 4 b) 1 c) 2 d) 1 4a) –6 or 1 b) 2 or 1 c) 2 d) 9