Exponential Equations using like bases.

Review

Properties:

- $x^3 \cdot x^4 = x^7$
  $4^6 \cdot 4^2 = 4^8$ > when mult. like bases keep base same and add exponents.

- $\frac{x^7}{x^3} = x^4$ $\quad \frac{x^3}{x^7} = \frac{1}{x^4}$
  $\frac{3^2}{3^6} = \frac{1}{3^4}$ > when dividing, keep base same and <u>subt</u> exp.

- $(x^3)^4 = x^{12}$
  $(5^2)^3 = 5^6$ > powers to powers keep base <u>same</u> <u>mult exponents</u>

negative exponents: ⇒ makes fractions (reciprocates base)

$3^{-2} = \frac{1}{3^2}$ $\quad \frac{1}{4^5} = 4^{-5}$

roots:

$\sqrt[2]{2} = 2^{\frac{1}{2}}$ $\quad \sqrt[3]{7} = 7^{\frac{1}{3}}$ $\quad \sqrt[5]{3^3} = 3^{\frac{3}{5}}$ → power, → root

$2^2=4$ $3^2=9$ $4^2=16$ $5^2=25$

$2^3=8$ $3^3=27$ $4^3=64$ $5^3=125$

$2^4=16$ $3^4=81$

$2^5=32$

$2^6=64$

Using like bases to solve exponentials

* Get exponential by itself ⇒ write as one exponential per side.
* Get like bases
* Set exponents = & solve.

Ex. $8^{2x+3}=8^{x-1}$

$2x+3=x-1$
$-x\ -3\quad -x\ -3$

$x=-4$

Ex. $2^x-6=10$
$+6\quad +6$

$2^x=16$
$2^x=2^4$
$x=4$

Ex. $3^2\cdot 3^{x-1}=\dfrac{3^{2x}}{3^4}$

$3^{2+x-1}=3^{2x-4}$

$x+1=2x-4$
$-x\quad -x$
$1=x-4$ → $\boxed{x=5}$

$$4^{x-3} = 2^{x+6}$$

$$\boxed{2^{2(x-3)} = 2^{x+6}}$$

$$\boxed{2(x-3) = x+6}$$

$$2x-6 = x+6$$
$$-x \qquad -x$$

$$x-6 = 6$$
$$+6 \quad +6$$

$$\boxed{x=12}$$

$$\sqrt[4]{7} = 49^{x-3}$$

$$7^{1/4} = 7^{2(x-3)}$$

$$\frac{1}{4} = 2(x-3)$$

$$\frac{1}{4} = 2x-6$$
$$+6$$

$$\frac{24}{4} + 6$$

$$\frac{1}{2} \cdot \frac{25}{4} = \frac{2x}{2}$$

$$\boxed{\frac{25}{8} = x}$$

$$\left(\frac{1}{32}\right)^{3x-4} = 4^{x+1}$$

$$2^{-5(3x-4)} = 2^{2(x+1)}$$

$$-5(3x-4) = 2(x+1)$$

$$-15x+20 = 2x+2$$
$$+15x \qquad +15x$$

$$20 = 17x+2$$
$$-2 \qquad -2$$

$$18 = 17x$$

$$\boxed{x = \frac{18}{17}}$$