

Solving Exponential Equations

Focus on...

- determining the solution of an exponential equation in which the bases are powers of one another
- solving problems that involve exponential growth or decay
- solving problems that involve the application of exponential equations to loans, mortgages, and investments

$$X' = X$$

$$X^{\circ} = 1$$

$$X^{\circ} = \frac{1}{\sqrt{2}}$$

$$X = \frac{1}{\sqrt{2}}$$

$$X^{m/n} = \sqrt[m]{x^m} e_{x} \sqrt{x} = X^{1/2}$$

$$X^{m/n} = (\sqrt[m]{x})^m e_{x} \sqrt[m]{x} = X^{1/2}$$

$$\sqrt[m]{x} = X^{1/2}$$

$$\frac{\chi^m}{\chi^n} = \chi^{m-n}$$
 (same base)

$$(xy)^{m} = x^{m}y^{m}$$

$$(X_{\mathbf{w}})_{\mathbf{v}} = X_{\mathbf{w} \cdot \mathbf{v}}$$

$$\left(\frac{x}{3}\right)^{m} = \frac{x^{m}}{y^{m}}$$

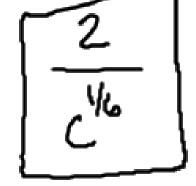
Review of Laws of Exponents:

1. Simplify each expression. Leave only positive exponents in your answer.

A)
$$\frac{(x^n)^2(x^{n+2})^2}{x^n}$$
 C) $\left(\sqrt{(a^{\frac{2}{3}})}\right)^{-3}$ $= \frac{\left(\chi^{2n}\right)\left(\chi^{2(n+2)}\right)}{\chi^n}$ $= \frac{\chi^{2n}\chi^{2n+4}}{\chi^n} = \frac{\chi^{2n+4}}{\chi^n} = \chi$ $= \chi$ $= \chi$ $= \chi$

D)
$$(2\sqrt[3]{c})\left(\frac{1}{\sqrt{c}}\right)$$

$$2(c)^{1/3} \cdot \frac{1}{c^{1/2}}$$



2. Evaluate each expression:

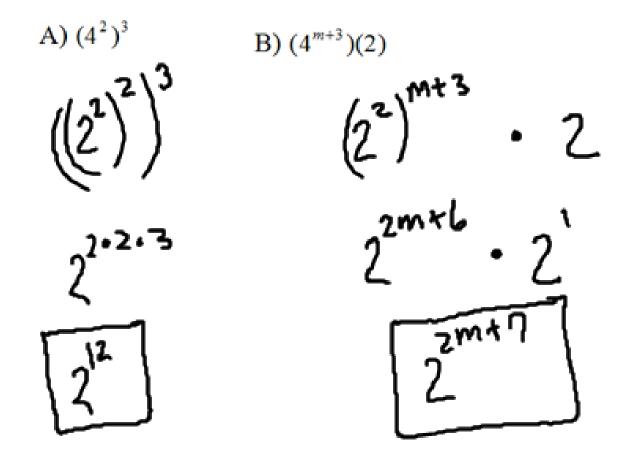
B)
$$(-6)^0$$

1

C)
$$-6^{\circ}$$

D)
$$\frac{5^{-3}}{5^{-4}}$$

3. Express each as a power of 2 and evaluate if possible.



4. Write each as a single power.

$$A) \frac{(8^{2n+1})(4^{2-n})}{(2^{2n})^3}$$

$$= \frac{(2^3)^{2n+1} \cdot (2^2)^{2-n}}{2^{6n}}$$

$$= \frac{2^{6n+3} \cdot 2^{4-2n}}{2^{6n}}$$

$$= 2^{4n+7} \div 2^{6n}$$

$$= 2^{4n+7} \div 2^{6n}$$

$$= 2^{4n+7} \div 2^{6n}$$

$$B) \frac{(6^{-3})(2^{4})(9^{-2})}{(27^{-4})(4^{-2})} = \underbrace{\left(2 \cdot 5\right)^{3} \cdot 2^{4} \cdot \left(3^{2}\right)^{-2}}_{(3^{3})^{-4} \cdot \left(2^{2}\right)^{-2}}$$

$$= \underbrace{2^{-3} \cdot 3^{-3} \cdot 2^{4} \cdot 3^{4}}_{3^{-12} \cdot 2^{-4}}$$

$$= \underbrace{2^{1} \cdot 3^{-7}}_{2^{1} \cdot 3^{-7}}$$

$$\frac{2^{1} \cdot 3^{2}}{3^{-12} \cdot 2^{-4}} = 2^{5} \cdot 3^{5} = (2.3)^{5} = 6^{5}$$

$$= 2^{1-(-4)} \cdot 3^{-7-(-12)} = 2^{5} \cdot 3^{5} = (2.3)^{5} = 6^{5}$$

Solve each of the following equations:

B)
$$5^{2x+3} = 5^{x-9}$$

since the bases are
the same we can
equate the exponents

C)
$$8^{2x} = 2^{4x+1}$$

I get a common base
$$(2^{3})^{2x} = 2^{4x+1}$$

$$2^{6x} = 2^{4x+1}$$

$$2^{6x} = 2^{4x+1}$$

$$2x = 1$$

$$2x = 1$$

$$(x = 1/2)$$

D)
$$3 = 48 \left(\frac{1}{2}\right)^{\frac{x}{92}}$$

$$\frac{3}{48} = \left(\frac{1}{2}\right)^{\frac{x}{92}}$$

$$\frac{1}{2} = \left(\frac$$

E)
$$81^{2x} = 27^{4x-5}$$

 $(3^{4})^{2x} = (3^{3})^{4x-5}$
 $3^{8x} = 3^{12x-15}$
 $8x = 12x-15$
 $-4x = -15$
 $x = 15$

F)
$$2(3^{x})-20=34$$

†20 †20

G)
$$\sqrt[5]{8^{x-1}} = \sqrt[3]{16^x}$$

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

$$2^{3\times -3} = 2^{4\times 13}$$

$$\frac{3x-3}{5} = \frac{4x}{3}$$

$$(3x-3)3 = 5(4x)$$

 $9x-9 = 20x$
 $-9 = 11x$

H)
$$9^{x} = 3^{x} + 6$$

 $(3^{2})^{x} = 3^{x} + 6$
 $3^{2 \cdot x} = 3^{x} + 6$
 $3^{x \cdot 2} = 3^{x} + 6$
 $(3^{x})^{2} = 3^{x} + 6$
 $(3^{x})^{2} - 3^{x} - 6 = 0$
 $(3^{x})^{2} - 3^{x} - 6 = 0$

$$(M-3)(M+2)=0$$
 $M-3=0$ $M+2=0$
 $M=3$ $M=-2$
 $3^{X}=3$ $3^{X}=-2$
 $3^{X}=3^{1}$ N_{0}
 N_{0}