

7.3 Part 1

Tuesday, November 22, 2022 1:46 PM

7.3 Solving Exponential Equations Part 1

Exponential Equation: An equation in which the variable is an exponent

eg $8^{5x+2} = 32^{x-4}$ $8^{5x+2} = 5^{x-4}$

Exponent Laws	
$x^m \cdot x^n = x^{m+n}$	$x^0 = 1$
$\frac{x^m}{x^n} = x^{m-n}$	$x^{-n} = \frac{1}{x^n}$
$(x^m)^n = x^{m \cdot n}$	$\sqrt[n]{x^m} = x^{\frac{m}{n}}$

Ex. #1: Which expression is greater?

a) 4^7 or 8^5

$(2^2)^7$ $(2^3)^5$

2^{14} 2^{15}

2^{15}

b) $\sqrt{27}$ or $\frac{1}{\sqrt[3]{9^2}}$

$\sqrt{3^3}$ $\frac{1}{9^{2/3}}$

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

3 $\frac{1}{3^3}$

3

Ex. #2: Solve $2^{2x+1} = 8$

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

$$2x+1 = 3$$

$$2x = 2$$

$$x = 1$$

1. Write both sides in the same base
2. When both sides are a single power in the same base the exponents are equal. Make an equation using the exponents.
3. Solve your equation.

Ex. #3: Solve $16^{x-1} = 64$

$$(2^4)^{x-1} = 2^6$$

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

$$4x - 4 = 6$$

$$4x = 10$$

$$x = 10/4$$

$$x = 5/2$$

Ex. #4: Solve $27^{x+2} = \left(\frac{1}{9}\right)^{2x+3}$

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

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

$$3x+6 = -4x-6$$

$$7x = -12$$

$$x = -12/7$$

$$\frac{1}{9} = \frac{1}{3^2} = 3^{-2}$$

Ex. #5: Solve $1 = 5^{2x+1}$

$$5^0 = 5^{2x+1}$$

$$0 = 2x + 1$$

$$-1 = 2x$$

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

$$1 = X^0$$

$$1 = 5^0$$

Ex. #6: Solve $25^{x+1} = \sqrt{5}$

$$25^{x+1} = \sqrt[2]{5^1}$$

$$(5^2)^{x+1} = 5^{\frac{1}{2}}$$

$$5^{2x+2} = 5^{\frac{1}{2}}$$

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

$$4x + 4 = 1$$

$$4x = -3$$

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

Ex. #7: Solve $\frac{2(81)^{2x+1}}{2} = \frac{18}{2}$

$$(81)^{2x+1} = 9^1$$

$$(9^2)^{2x+1} = 9^1$$

$$9^{4x+2} = 9^1$$

$$4x + 2 = 1$$

$$4x = -1$$

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