

Solving Exponential Equations

ex: $3^{5x-6} = 3^{3x}$

$$5x - 6 = 3x$$

$$-6 = -2x$$

$$3 = x$$

* if both bases are the same, then the exponents must be equal

ex: $6^{2x} = 6^{-2x+3}$

$$2x = -2x + 3$$

$$4x = 3$$

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

ex: $5^{x+1} = 125$

$$5^{x+1} = 5^3$$

$$x+1 = 3$$

$$x = 2$$

* if bases are not the same, convert to the same base

ex: $4 = 8^{2x+2}$

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

$$2 = 3(2x+2)$$

$$2 = 6x + 6$$

$$-4 = 6x$$

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

ex: $16^{3x-1} = 64^{2x-3}$

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

$$2(3x-1) = 3(2x-3)$$

$$6x - 2 = 6x - 9$$

$$-2 \neq -9$$

no sol

ex: $4^{-3x+2} = \frac{1}{32}$

$$4^{-3x+2} = 32^{-1}$$

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

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

$$-6x + 4 = -5$$

$$-6x = -9$$

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

Solving Exponential Equations

Ex: $3^{2x} = 3^{4x-9}$

* if the bases
are the same,
then the expo
must be equal

$$2x = 4x - 9$$

$$-2x = -9$$

$$x = 9/2$$

Ex: $4^{2x-1} = 4^{6x+3}$

$$2x-1 = 6x+3$$

$$-4x = 4$$

$$x = -1$$

Ex: $5^{3x-2} = 125$

$$5^{3x-2} = 5^3$$

$$3x-2 = 3$$

$$3x = 5$$

$$x = 5/3$$

Exponential Equation

Ex: $6^{2x} = 6^{-2x+3}$

* if the bases
are the same,
then the
exponents must
be =

$$2x = -2x + 3$$

$$4x = 3$$

$$x = 3/4$$

Ex: $2^{2x} = \underline{64}$

how to change base of 2

$$\underline{2^{2x} = 2^6} \quad 2^6 = 64$$

bases are same

$$2x = 6$$

$$x = 3$$

Ex: $4^{2x+5} = 8^{3x-10}$

$$(2^2)^{2x+5} = (2^3)^{3x-10}$$

$$2(2x+5) = 3(3x-10)$$

$$4x+10 = 9x-30$$

$$40 = 5x$$

$$8 = x$$

Ex: $3^{4x+1} = \frac{1}{81}$

$$3^{4x+1} = 81^{-1}$$

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

$$4x+1 = -4$$

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

Ex: $\left(\frac{1}{5}\right)^3 = 625^{2x}$

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

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

$$-3 = 8x \quad x = \frac{-3}{8}$$

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

* need to change both bases

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

$$6x-2 = 3x-9$$

$$\underline{3x+2} \quad \underline{-3x+2}$$

$$3x = -7 \quad x = \frac{-7}{3}$$