

Check-Up:

Express as a power of 3:

$$\frac{\sqrt[5]{27} \cdot 81^{-4}}{\sqrt[7]{9 \cdot \sqrt{3}}}$$

$$\frac{(3^3)^{1/5} \cdot (3^4)^{-4}}{(3^2 \cdot 3^{1/2})^{1/7}}$$

$$\frac{3^{3/5} \cdot 3^{-16}}{(3^{9/2})^{1/7}} = \frac{3^{3/5} \cdot 3^{-16}}{3^{5/14}}$$

$$\frac{42 - 1120 - 25}{70} = 3^{3/5 + -16 - \frac{5}{14}}$$

$$\frac{-1103}{70}$$

$$= 3^{-\frac{1103}{70}}$$

Use the ideas from the last few slides...

solve $9^{2x-5} = 27$

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

$$3^{4x-10} = 3^3$$

exponents
Must Be
Equal

$$4x - 10 = 3$$

$$4x = 13$$

$$x = \frac{13}{4}$$

Solve the Following Exponential Equations

STEPS:

- 1) Write each side with the same base
- 2) Compare exponents
- 3) Solve equation

a) $5^x = \frac{1}{25}$

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

b) $81 = 27^{3x-1}$

$$3^4 = (3^3)^{3x-1}$$
$$3^4 = 3^{9x-3}$$
$$4 = 9x - 3$$
$$7 = 9x$$
$$x = \frac{7}{9}$$

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

$$x^2 - 3x = 2x - 4$$
$$x^2 - 5x + 4 = 0$$
$$(x-4)(x-1) = 0$$
$$x = 4 \text{ or } 1$$

...A little more difficult??

$$a) (2^{x+1})(4^{x+1})(8^{x+1}) = 128$$

$$(2^{x+1})(2^{2(x+1)})(2^{3(x+1)}) = 2^7$$

$$(2^{x+1})(2^{2x+2})(2^{3x+3}) = 2^7$$

$$2^{6x+6} = 2^7$$

$$\therefore 6x+6 = 7$$

$$6x = 1$$

$$x = \frac{1}{6}$$

$$b) \left(\frac{1}{9}\right)^{x-2} = \left(\frac{1}{27}\right)^{x+2}$$

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

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

$$-2x+4 = -3x-6$$

$$x = -10$$

Exercise: Solve each of the following...

#1. a) $\left(\frac{1}{4}\right)^{x+2} = \left(\frac{1}{8}\right)^{x+3}$ $x = -5$
 b) $9^{2x-4} = 27^{x-1}$ $x = 5$
SOLUTIONS

#2. a) $2^{x^2} = 32(2^{4x})$ $x = -1 \text{ \& } 5$
 b) $3^{x^2} = 27(3^{2x})$ $x = -1 \text{ \& } 3$
 c) $9^{2x+1} = 81(27^x)$ $x = 2$
 d) $2^{2x+2} + 7 = 71$ $x = 2$
SOLUTIONS

2. a) $2^{x^2} = 32(2)^{4x}$
 $2^{x^2} = 2^5(2)^{4x}$
 $2^{x^2} = 2^{5+4x}$
 $x^2 = 5+4x$
 $x^2 - 4x - 5 = 0$
 $(x-5)(x+1) = 0$
 $x = 5, -1$

d) $2^{2x+2} + 7 = 71$
 $2^{2x+2} = 64$

This is a little different...hmmm...any ideas??

Solve the following...

$$2^{2x} - 33(2^x) + 32 = 0$$

$$(2^x)^2 - 33(2^x) + 32 = 0$$

Substitute
A
New
Variable

⇒ Let $m = 2^x$

$$m^2 - 33m + 32 = 0$$

$$(m-32)(m-1) = 0$$

Re-Sub

$$m = 32$$

$$m = 1$$

⇒

$$2^x = 32$$

$$2^x = 1$$

$$x = 5$$

$$x = 0$$

What if ...

$$m = -32$$

$$m = 1$$

$$2^x = -32$$

$$2^x = 1$$

∅

$$x = 0$$

Solve the following...

$$125(5^{2x}) - 30(5^x) + 1 = 0$$

$$125(5^x)^2 - 30(5^x) + 1 = 0$$

$$m = 5^x$$
$$125m^2 - 30m + 1 = 0$$

$$125m^2 - 25m - 5m + 1 = 0$$

$$25m(5m-1) - 1(5m-1) = 0$$

$$(5m-1)(25m-1) = 0$$

$$5m-1=0$$

$$m = \frac{1}{5}$$

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

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

$$x = -1$$

$$25m-1=0$$

$$m = \frac{1}{25}$$

$$5^x = \frac{1}{25}$$

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

$$x = -2$$

Homework...



Worksheet - Solving Exponential Equations.doc

7, 8, 10, 11, 12

Attachments

Worksheet - Solving Exponential Equations.doc