Algebra 2 7.2

Solve exponential equations $=$

Solve exponential inequalities $\leq \geq$

equation

inequality

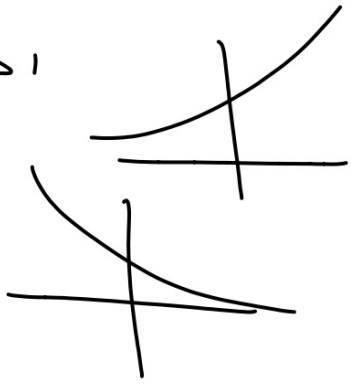
exponential increase (rate of increase) $b > 1$

exponential decrease (rate of decrease) $0 < b < 1$

interest (n)

compound interest

whiteboards



Are the answers equal?
Are the bases the same?
Then the exponents must be the same.

KeyConcept Property of Equality for Exponential Functions

Words	Let $b > 0$ and $b \neq 1$. Then $b^x = b^y$ if and only if $x = y$.
Example	If $3^x = 3^5$, then $x = 5$. If $x = 5$, then $3^x = 3^5$.

$3^x = 3^5$ $\quad x = 5$

Express on same base: convert one or both

Example 1 Solve Exponential Equations

Solve each equation.

a. $2^x = 8^3$

$2^x = (2^3)^3$

$2^x = (2^3)(2^3)(2^3)$

$2^x = 2^9$ $\quad x = 9$

If the bases are the same...
and the numbers are equal...
the exponents must be the same!

b. $9^{2x-1} = 3^{6x}$

$$(3^2)^{2x-1} = 3^{6x}$$

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

$$4x - 2 = 6x$$
$$-4x \quad -4x$$
$$-2 = 2x$$
$$x = -1$$

GuidedPractice

1A. $4^{2n-1} = 64$

$4^{2n-1} = 4^3$

$4^{3x-2} = 128$

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

$6x - 4 = 7$

$+4 \quad +4$

$\frac{6x}{6} = \frac{11}{6}$

1B. $5^{5x} = 125^{x+2}$

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

$5x = 3x + 6$

$2x = 6$

$x = 3$

$y = a\left(\frac{1+r}{1-r}\right)^t$

GuidedPractice (Assume exponential change)

2. RECYCLING A manufacturer distributed 3.2 million aluminum cans in 2005.

A. In 2010, the manufacturer distributed 420,000 cans made from the recycled cans it had previously distributed. Assuming that the recycling rate continues, write an equation to model the distribution each year of cans that are made from recycled aluminum.

B. How many cans made from recycled aluminum can be expected in the year

2005 3,200,000
2010 420,000
5

$420{,}000 = 3{,}200{,}000(1-r)^5$

$0.13125 = (1-r)^5$

$0.666 = r$

$-1 \quad -1$

$-0.334 = -r$

$r = 0.334$

$n = 3{,}200{,}000(1-.334)$

2030? 123.5
2040? 2
2050? 0.04

Domain???

Monthly 12
Daily 365
Quarterly 4
Weekly 52
etc....

Exponential functions are used in situations involving compound interest. **Compound interest** is interest paid on the principal of an investment and any previously earned interest.

KeyConcept Compound Interest

You can calculate compound interest using the following formula.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

t=years

where A is the amount in the account after t years, P is the principal amount invested, r is the annual interest rate, and n is the number of compounding periods each year.

Nick Dolding/Cultura/Getty Image

n= number of compounding periods (will write this on the board when needed)

quarterly
monthly
weekly
daily
semiannually
etc.

0,042 n=12

Example 3 Compound Interest

An investment account pays 4.2% annual interest compounded monthly. If $2500 is invested in this account, what will be the balance after 15 years?

$$y = 2500\left(1 + \frac{0.042}{12}\right)^{12 \cdot 15}$$

$$(1 + 0.0035)$$

$$\$4688.87 \quad (1.0035)^{180}$$

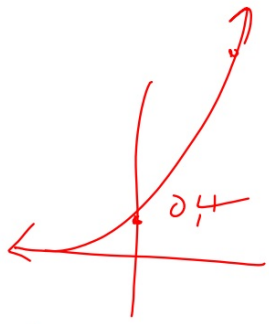
GuidedPractice

3. Find the account balance after 20 years if $100 is placed in an account that pays 1.2% interest compounded twice a month.

0.012

$$100\left(1+\frac{0.012}{2.4}\right)^{24\cdot 20}$$

$\$127.12$



$y = 4 \cdot 3^x$

$(0,4)$

$(2,36)$

$y = 4(\quad)^x$

$\frac{36}{4} = \frac{4(b)^2}{4}$

$9 = b^2$

$\pm 3 = b$