Properties of Exponents Notes

Expand: $x^5 =$	Compress: $x \cdot x \cdot x \cdot x \cdot x \cdot x =$
Product of Power: $x^a \cdot x^b = x^{a+b}$ Ex.1 $x^2 \cdot x^3 =$ Ex.2 $(4^3ab^7)(4^2a^3b) =$	Power of a Power: $(x^a)^b = x^{a \cdot b}$ Ex.3 $(x^2)^3 =$
Power of a Product: $(xy)^a = x^a \cdot y^a$ Ex.4 $(xy)^3 =$ Ex.5 $(4x^3)^2 =$	Quotient of a Power $\frac{x^a}{x^b} = x^{a-b}$ Ex.6 $\frac{5^6}{5^3} =$
Power if a Quotient: $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$ Ex.7 $\left(\frac{x}{4}\right)^3 =$	Zero Exponent: $x^o = 1$ Ex.8 $x^0 =$ Ex.9 $(15abc)^0 =$
Negative Exponents: $x^{-m} = \frac{1}{x^m}$ Ex.10 $x^{-3} =$ Ex.11 $\left(\frac{x}{2}\right)^{-2} =$ Ex.12 $\frac{x^2y^{-3}z^{-2}}{m^{-2}z^2y^3} =$	Simplify. ***Combine terms and only have positive exponents. Ex.13 $\frac{r^2}{2r^3}$ Ex.14 $\frac{3m^{-3}}{3^4}$ Ex.15 $\frac{4x^0y^{-2}z^3}{4x}$

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Exponential Growth and Decay

Exponential Growth

$$y = a(1 + r)^x \rightarrow Same\ as\ y = ab^x$$

This function is used when the initial amount **INCREASES** by a fixed percent or factor each time period

a is the: _____
r is the: _____ in decimal form
x is the: _____

if $b > 1$, then the function is exponential _____ (because the base of the exponent is greater than 1.

Ex.1 $f(x) = 4(1.5)^x \rightarrow Same\ as$ _____
$a =\quad , b =$

What is the initial amount? _____
What is the rate of growth? _____

Exponential Decay

$$y = a(1 - r)^x \rightarrow Same\ as\ y = ab^x$$

This function is used when the initial amount DECREASES by a fixed percent or factor each time period.

a is the: _____
r is the: _____ in decimal form
x is the: _____

if $0 < b < 1$, then the function is exponential _____ (because the base of the exponent is less than 1).

Ex.2 $f(x) = 4(0.25)^x \rightarrow same\ as$ _____
$a =\quad , b =$

What is the initial amount? _____
What is the rate of decay? _____

Ex.3 A Gila Monster is about 16 cm long at birth. During the beginning of its life, the Fila Monster's length increases by about 15% each week.

a. Write a function that models the length of the Gila Monster at the beginning of the Gila Monster's life. Use x for the number of weeks and y for the length of the Gila Monster.

Define variables:

$x =$
$y =$
$a =$
$b =$

Write the function: _____

b. Find the length of the Gila Monster ant the end of the 3 weeks.

Ex.4 A 500 mL puddle of water is evaporating at a rate of 4.5% per hour.

a. Write a function that represents the amount of water in the puddle at a given time. Use x for hours and y for the amount of water left in the puddle.

Define variables:

$x =$
$y =$
$a =$
$b =$

Write the function: _____

b. Determine when the puddle will be reduced to half its original volume.

Compound interest

Compound interest is the interest earned or paid on both the principal and previously earned interest.

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

A represents the balance after t years.
P represents the principal, or the original amount.
r represents the annual interest rate expressed as a decimal.
n represents the number of times interest is compounded per year.
t represents time in years.

Annually means “once per year” (n=1)
Quarterly means “4 times per year” (n=4)
Monthly means “12 times per year” (n=12)
Daily usually means “365 times per year” (n=365)

Write a compound interest function to model the situation. Then find the balance after the given number of years.

Ex.1 $1200 invested at a rate of 2% compounded quarterly for 3 years.	Ex.2 $15,000 invested at a rate of 4.8% compounded monthly for 2 years.
Ex.3 $1200 invested at a rate of 3.5% compounded quarterly for 4 years.	Ex.4 $4000 invested at a rate of 3% compounded monthly for 8 years.
Ex.5 $4000 invested at a rate of 3% compounded monthly for 8 years.	Ex.6 Compare example 4 and 5. Would you want your investment compounded more or less?