## I can write an exponential function ($y = a \cdot b^{x/c}$) from a table.

The starting y-value for the patterns below is located when x = 0.

I can find the MULTIPLIER by dividing 2 consecutive y-values

The pattern in the x-values in the table affect the function's c-value.

| | | | | |
|---|---|---|---|---|
| x | 0 | 1 | 2 | 3 |
| y | 300 | 225 | 168.75 | 126.5625 |

$\frac{225}{300} = .75$

$y = 300 \cdot (.75)^{x}$

| | | | | |
|---|---|---|---|---|
| x | 0 | 2 | 4 | 6 |
| y | 4 | 12 | 36 | 108 |

$\frac{12}{4} = 3$

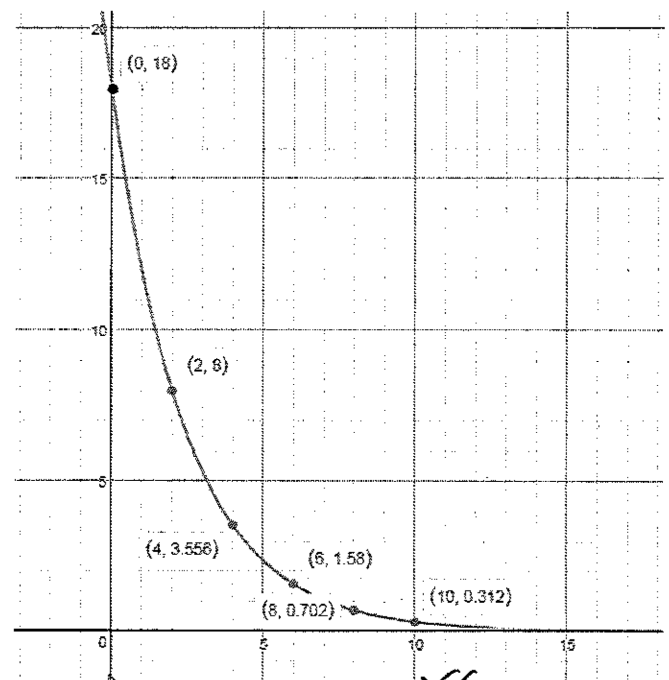
$y = 4 \cdot (3)^{x/2}$

## I can write an exponential function ($y = a \cdot b^{x/c}$) from a graph.

The starting y-value for the pattern below is located on the y-axis.

I can find the MULTIPLIER by dividing consecutive y-values.

The pattern in the x-values in the graph affect the function's c-value.




$\frac{8}{18} = .\overline{4}$

$y = 18 \cdot (.\overline{4})^{x/2}$

OR

$18 (4/9)^{x/2}$

**I can use the COMPOUND INTEREST FUNCTION $F(t) = P(1+\frac{r}{n})^{\frac{t}{n}}$ to solve problems.**

In the COMPOUND INTEREST FUNCTION, the initial investment is represented by P; the annual interest rate is r, the number of years is t, and $n$ is the # of compounds per year

$10000 is invested in a fund that pays 5% interest every year. Find the amount of money in the account after 15 years.

$10000(1+.05)^{15} = 20789.28$

$1000 is invested in a fund that compounds interest MONTHLY. After 3 years, the fund had a balance of $1196.68. What is the annual interest rate for this fund?

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| y | 1000 | | | 1196.68 |

$\cdot m \quad \cdot m \quad \cdot m$

$\frac{1000 \cdot m^3}{1000} = \frac{1196.68}{1000}$

$\sqrt[3]{m^3} = \sqrt[3]{1.19668}$

$m = 1.06 \rightarrow 6\%$

**I can explain the meaning of ZERO as an EXPONENT.**

The EXPONENTIAL expression $4 \cdot 3^0$ = 4 because $3^0$ means to multiply 4 by zero 3s. Which is equivalent to multiplying 4 by one.

Multiplying by "1" has "0" impact.

**I can explain the meaning of FRACTIONAL EXPONENTS.**

The EXPONENTIAL Expression $8^{\frac{1}{3}} = (2 \cdot 2 \cdot 2)^{\frac{1}{3}} = 2$.

A fractional exponent is equivalent to taking a root. For example, $8^{\frac{1}{3}}$ is equivalent to the cube root of 8.

**I can determine the PERCENT increase or decrease rate of change in an EXPONENTIAL Function.**

If the MULTIPLIER is Greater than 1, the function represents a GROWING pattern.

If the MULTIPLER is between zero and One, the function represents a DECREASING pattern.

The PERCENT (written as a decimal) increase is the amount the MULTIPLIER EXCEEDS 1.

The PERCENT (written as a decimal) decrease is the amount the MULTIPLIER is less than 1.

$f(x) = 200(1.06)^x$ represents 6% increase

$g(x) = 150(0.94)^x$ represents 6% decrease.

$h(x) = 20(1.77)^x$ represents 77% increase

$j(x) = 500(.88)^x$ represents 12% decrease.

**I can explain the meaning of NEGATIVE EXPONENTS.**

The EXPONENTIAL Expression $\frac{x^5}{x^7}$ simplifies to either $x^{-2}$ or $\frac{1}{x^2}$.

A positive exponent is a shortcut repeated multiplication.

A negative exponent is a shortcut for repeated Division.

| AA4 Notes: Part 2 Logarithms | |
|---|---|
| I can translate between exponential and logarithmic forms.<br>1. Write $y = 4^x$ in logarithmic form.<br>$y = \log_4 x$<br>2. Write $y = log_3 x$ in exponential form.<br>$y = 3^x$ | |
| I can find the inverses of exponential and logarithmic functions.<br>1. Find the inverse of $f(x) = 2(5^x) - 2$<br>$\frac{y+2}{2} = \frac{2(5)^x}{2} \rightarrow \log_5 \frac{y+2}{2} = \log_5 5^x \rightarrow$<br>2. Find the inverse of $g(x) = 2log_8(x+1)$<br>$\frac{y}{2} = \log_8(x+1) \rightarrow 8^{y/2} = x + 1$ $-1$ | $\log_5\left(\frac{y+2}{2}\right) = x \rightarrow f^{-1}(x) = \log_5\left(\frac{x+2}{2}\right)$<br>$\rightarrow 8^{y/2} - 1 = x \rightarrow g^{-1}(x) = 8^{x/2} - 1$ |

I can solve equations using the definition of exponents and logarithms.

1. Solve for x:

   a. $3^x + 4 = 31$

   $-4 \quad -4$

   $\log_3 3^x = 27 \quad \log_3$

   $x = \log_3 27$

   $x = 3$

   b. $2(5^{4x}) - 1 = 249$

   $+1 \quad +1$

   $\frac{2(5^{4x})}{2} = \frac{250}{2}$

   $5^{4x} = 125 \rightarrow 4x = \log_5 125$

   $4x = 3$

   $x = 3/4$

2. Solve for x:

   a. $\log_{10}(x + 2) = 2$

   $x + 2 = 10^2 \rightarrow x + 2 = 100 \rightarrow x = 98$

   $\quad -2 \quad -2$

   b. $0.25 \log_4(3x) - 5 = 11$

   $+5 \quad +5$

   $\frac{.25 \log_4(3x)}{.25} = \frac{16}{.25} \rightarrow \log_4(3x) = 64 \rightarrow \frac{3x}{3} = \frac{4^{64}}{3} \rightarrow x = \frac{4^{64}}{3}$

I can graph and find characteristics (intercepts, asymptotes) of exponential and logarithmic functions.

1. Find the y-intercept and horizontal asymptote of $k(x) = 3(2^x) - 12$

   y-int: $k(0) = 3(2^0) - 12$

   $= 3 - 12$

   $k(0) = -9$

   H.A. $y = -12$

2. Find the x-intercept(s) and vertical asymptote of $m(x) = 2\log_4(x + 2) - 6$

   VA: $x = -2$

   x-int: $0 = 2\log_4(x+2) - 6$

   $+6 \quad +6$

   $\frac{6}{2} = \frac{2\log_4(x+2)}{2} \rightarrow 3 = \log_4(x+2) \rightarrow 64 = x + 2 \rightarrow 62 = x$

   $-2 \quad -2$