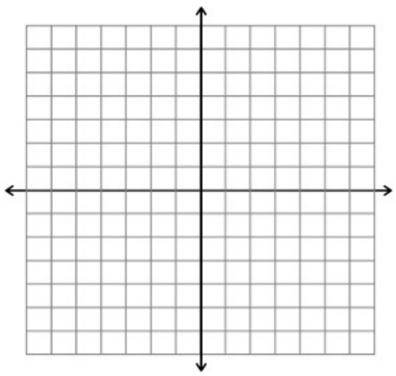
EXPONENT PROPERTIES REVIEW

Review of Exponential Functions

W-up: Graph $y = 3^x$

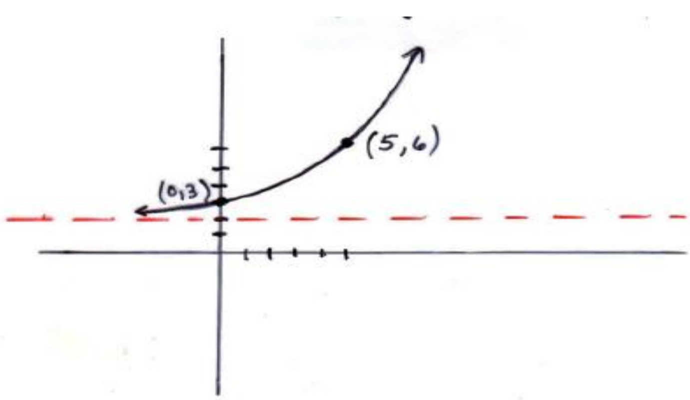


Exponential Function: Function with a numeric(constant) base taken to a VARIABLE power with general equation $y = a \bullet b^x$, $b > 0$ and $b \neq 1$ where $(0, a)$ is the y-intercept and $y = 0$ (x-axis) is the horizontal asymptote.

EX) Evaluate each limit using its graph.

A) $\lim_{x \to \infty} 3 \bullet 2^x - 5$ B) $\lim_{x \to \infty} \left(\frac{1}{3}\right)^{x-5} + 1$ C) $\lim_{x \to -\infty} \frac{2}{3} \bullet 6^x$

EX) Write an exponential equation for the following graph.



NEWTON'S LAW OF COOLING(basic exponential decay with translated asymptote)

EX) A pizza heated to 425°F is taken out of the oven and placed in a room that is 70°F. Five minutes later the temperature of the pizza is 185°F. What is the temperature of the pizza after 15 minutes?

Note: asymptote must be reflected in the equation!

Use the graphing calculator to verify the following limit.

$$\lim_{x \to \infty} \left(1+\frac{1}{x}\right)^x \begin{array}{l} = e \\ \approx 2.718.... \end{array}$$

"e" is used in many real world formulas(specifically in compounding interest **continuously**)

Exponential Growth and Decay

When real world examples are known to have exponential growth or decay use the following formulas:

A) When the RATE of growth/decay is known:

$A(t) = A_0 (1 \pm r)^t$ Note: Annual Growth is Implied

Where $A(t)$ is the amount after time t.

A_0 is the original amount invested

r is the annual interest rate("+" for growth and "-" for decay)

t is the time in years

EX) The value of a $10,000 ring appreciates exponentially 2% per year. What is it worth 20 years from now?

NOTE: If growth is known to increase CONTINUOUSLY at a certain rate the formula $A(t) = A_0 e^{rt}$ MUST be used since growth is not ANNUAL!

EX) The value of a $10,000 ring grows continuously at 2% per year. What is it worth 20 years from now?

B) When the rate is *not* given but the FACTOR of growth/decay is known:

$$A(t) = A_0 (b)^{t/k}$$

Where $A(t)$ is the amount after time t

A_0 is the original amount invested

b is the factor of growth and decay

k is the time in years it takes for b to happen

t is the time in years

EX) If $14,000 doubles in an account every 12 years. How much is in an account after 5 years?

Half-Life: time it takes for something to decay ONE-HALF its original amount

EX) The half-life for an isotope is 1200 years. If there are 50g present now, how much is remaining after 50 years?