AAT Name _____

2-4 Exponential Functions Date _____ **A#7**

Goal: Understand and use exponential growth and decay functions

Review: Linear functions show an additive pattern of change: $f(x) = mx + b$. For example, $C(w) = 5{,}501w - 372$, describes the cost, *C*, of a diamond ring with a weight, *w*, in carats. In this context, what does the slope describe?

Questions

Exponential Growth and Decay

Exponential functions show a _____ pattern of change and take the form :

$$f(x) = ab^x ,$$

where $a \neq 0$ and represents the _____ and $b > 0, b \neq 1$ and represents the _____ .

Example 1

Presently, the towns of Scarcedale and Ampleton both have approximately 8500 residents. Over the next 5 years, the population of Ampleton is expected to increase by approximately 2.3% per year, while the population of Scarcedale is expected to decrease by about 0.9% each year.

a. Create equations to describe the population of each town as a function of time.

b. Compare the projected populations after 5 years.

Questions

Example 2

Jonas received a letter from his credit union stating that a 5-year CD his parents opened for him had matured and he could choose one of the following options:

(1) Withdraw the full amount of $14,204.10.

(2) Use the money to open a new 5-year CD with an APY of 2.81%.

(3) Have the money deposited into his interest checking account which earns 0.95% per year.

Assume Jonas's parents deposited $12,000 into the CD 5 years ago.

a. What is an equation for the balance of the old CD after 5 years?

b. Use the equation from Part a to find the annual yield of the old CD.

c. Compare the results of options (2) and (3).

Exponential growth function graphs _____ The growth occurs when _____	*Exponential decay function* graphs _____ The decay occurs when _____

Questions

Activity

Using your amazing graphing calculator, find the exponential function that produces each graph. Check that the given points are included by using the TABLE or TRACE functions on your calculator

Steps:

1. Enter the two points into L_1 and L_2 .
2. Select STAT ->CALC -> ExpReg
3. Substitute *a* and *b* into $f(x) = ab^x$

a.

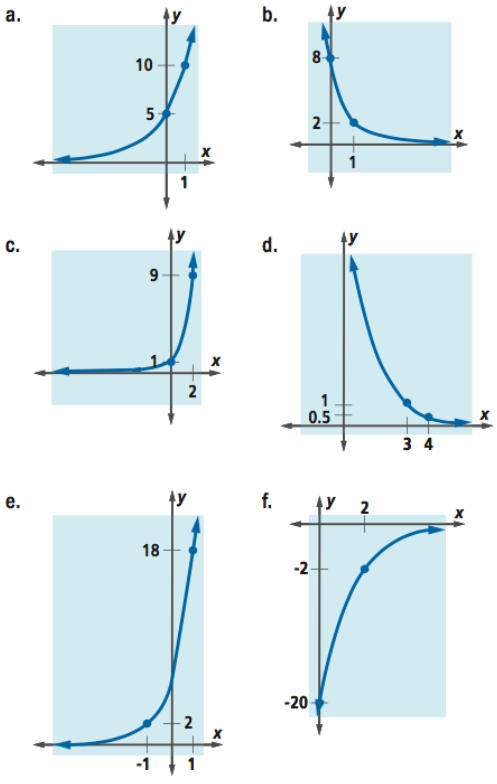
b.

c.

d.

e.

f.



Common Features of Exponential Functions

Compare and contrast the six functions above.

Asymptote:

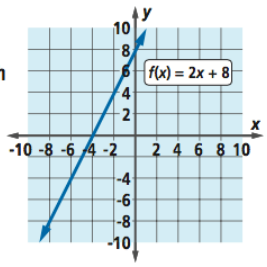
Questions

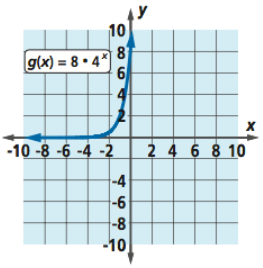
Example 3

Example 3

For each function characteristic, compare and contrast the linear function $f(x) = 2x + 8$ with the exponential function $g(x) = 8 \cdot 4^x$.

a. domain and range
b. y-intercept and x-intercept
c. asymptote
d. increasing or decreasing





Summary of Exponential Functions

a. The domain is _____

b. If $a > 0$, then the range is _____
If $a < 0$, then the range is _____

c. The graph contains the point _____

d. The _____ is the asymptote for the graph

e. For positive values of a, if $b > 1$, then the function is _____. If $0 < b < 1$, then the function is _____. For negative values of a (less common), then the situation is _____