DATE: _____

Unit 3 (Chapter 3): Exponential, Logistic, & Logarithmic Functions **Pre-Calculus**

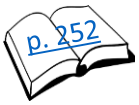
3.1 Exponential & Logistic Functions

Target 3A: Identify and analyze properties of exponential, logarithmic, and logistic functions and their graphs

Review of Prior Concepts

Which of the following functions are exponential functions? Explain why.

1) $f(x) = x^8$ **2)** $g(x) = 3^x$ **3)** $h(x) = 5^x$ **4)** $k(x) = 4^2$



More Practice

Introduction to Exponential Functions

http://www.virtualnerd.com/algebra-2/exponential-logarithmic-functions/exponentials/exponential-functions/function-definition

https://www.khanacademy.org/math/algebra/introduction-to-exponential-functions/exponential-growth-and-decay/v/exponential-growth-functions

https://www.youtube.com/watch?v=jnOwrj8OvYI

SAT Connection

Passport to Advanced Math

14. Use structure to isolate or identify a quantity of interest in an expression

Example: If $3x - y = 12$, what is the value of $\frac{8^x}{2^y}$?

A) 2^{12}

B) 4^4

C) 8^2

D) The value cannot be determined from the information given.

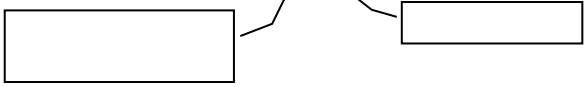
Solution

Exponential Functions

a, *b*, and *k* are real number constants,

$f(x) = a \cdot b^x$

$f(x) = a \cdot e^{kx}$



Exponential Function	**Exponential Growth**		**Exponential Decay**	
	Conditions	*Example*	*Conditions*	*Example*
$f(x) = a \cdot b^x$				
$f(x) = a \cdot e^{kx}$				

Example 1:

Identify if the function is exponential.

If yes, determine if exponential growth or exponential decay and describe its end behavior.

a) $f(x) = 3^{-x}$ **b)** $g(x) = (0.5)^{-x}$ **c)** $h(x) = x^{-3}$ **d)** $f(x) = 3e^{2x}$

Example 2:

Determine a formula for the exponential function whose values are given.

Use the model to predict the population (in millions) for 2010.

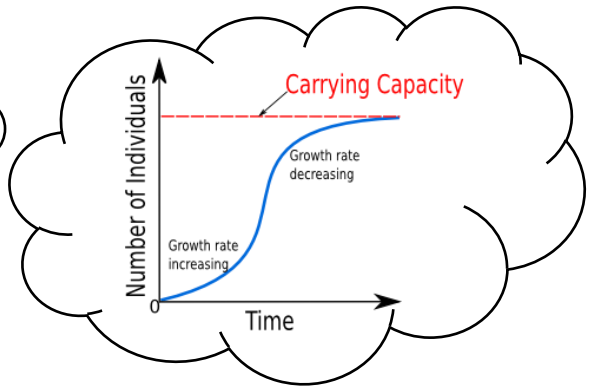
Year	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Population (in millions)	76.2	92.2	106.0	123.2	132.2	151.3	179.3	203.3	226.5	248.7	281.4

Logistic Growth Functions

a, *b*, *c*, and *k* are positive constants,

$f(x) = \frac{c}{1+a \cdot b^x}$ $f(x) = \frac{c}{1+a \cdot e^{-kx}}$

Science Connection

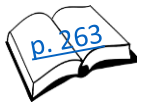


Examples

1. Sketch the graph of $f(x) = \frac{5}{1+8 \cdot 0.2^x}$. Identify the horizontal asymptotes and the *y*-intercept.

2. p.263 #55

3. p.263 #52



More Practice

Exponential Functions

https://www.mathsisfun.com/sets/function-exponential.html
https://www.khanacademy.org/math/algebra/introduction-to-exponential-functions
http://www.regentsprep.org/regents/math/algtrig/ATP8b/exponentialfunction.htm
https://www.youtube.com/watch?v=PEtIQqvIoGU
https://www.youtube.com/watch?v=hx_h0_eo8ew

Logistic Functions

http://www.classzone.com/eservices/home/pdf/student/LA208HAD.pdf
https://www.youtube.com/watch?v=O0j4rjTM88Q

Homework Assignment

p.262 #31,33,41,43,45,46,56,57

SAT Connection

Solution

Choice A is correct. One approach is to express $\frac{8^x}{2^y}$ so that the numerator and denominator are expressed with the same base. Since 2 and 8 are both powers of 2, substituting 2^3 for 8 in the numerator of $\frac{8^x}{2^y}$ gives $\frac{(2^3)^x}{2^y}$, which can be rewritten as $\frac{2^{3x}}{2^y}$. Since the numerator and denominator of $\frac{2^{3x}}{2^y}$ have a common base, this expression can be rewritten as 2^{3x-y}. It is given that $3x - y = 12$, so one can substitute 12 for the exponent, $3x - y$, giving that the expression $\frac{8^x}{2^y}$ is equal to 2^{12}.

Choices B and C are incorrect because they are not equal to 2^{12}. Choice D is incorrect because the value of $\frac{8^x}{2^y}$ can be determined.