

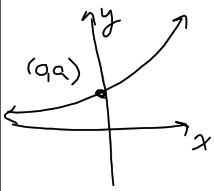
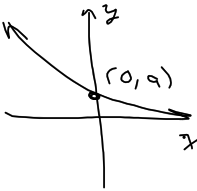
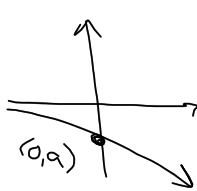
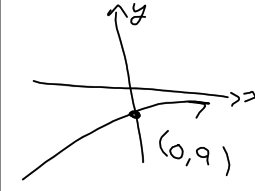
3.4 Properties of Exponential Functions

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

Investigate with Desmos and note how the exponential function changes as the base "b" and initial value "a" changes.

Look for:

- ★ The location of the x and y intercepts?
- ★ The location of the horizontal asymptote?
- ★ The Domain and Range

	ex: $a > 0, b > 1$ $a = 3$ $b = 2$	$a > 0, 0 < b < 1$ $a = 2$ $b = \frac{1}{2}$	$a < 0, b > 1$ $a = -3$ $b = 2$	$a < 0, 0 < b < 1$ $a = -3$ $b = \frac{1}{2}$
Transformations	Base $y = b^x$ \therefore V.S. by a	Base $y = b^x$ \therefore V.S. by a	\therefore Vert. Refl. \therefore V.S. by a	\therefore Vert. Refl. \therefore V.S. by a
Domain	$\{x \in \mathbb{R}\}$	$\{x \in \mathbb{R}\}$	$\{x \in \mathbb{R}\}$	$\{x \in \mathbb{R}\}$
Range	$\{y \in \mathbb{R} \mid y > 0\}$	$\{y \in \mathbb{R} \mid y > 0\}$	$\{y \in \mathbb{R} \mid y < 0\}$	$\{y \in \mathbb{R} \mid y < 0\}$
x-int	None	None	None	None
y-int $\rightarrow f(0)$	a	a	a ex: (0, -3)	a
Horizontal Asymptote	$y = 0$ (x-axis)	$y = 0$	$y = 0$	$y = 0$
Growth or Decay	GROWTH	DECAY		
Sketch				

Ex.2 Match the graph with the equation.
There are extra equations.

$y=2^x$ B

$y=3^x$ C

$y= -3^x$ D

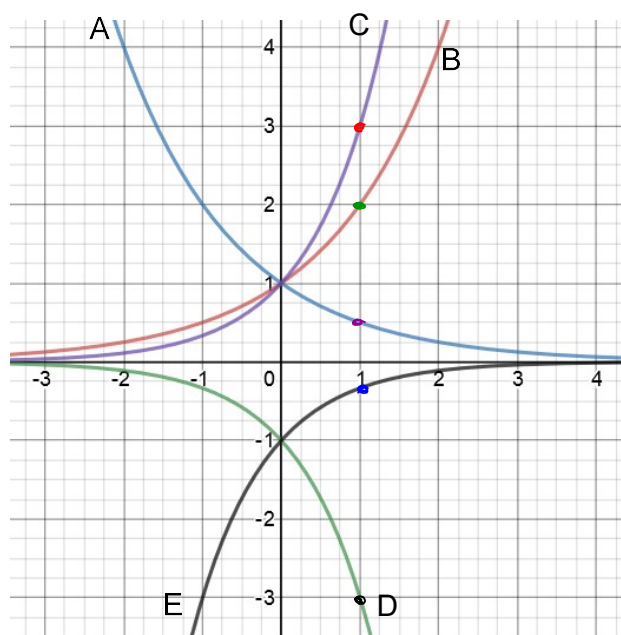
$y= -2^x$ —

$y= \left(\frac{1}{2}\right)^x$ A

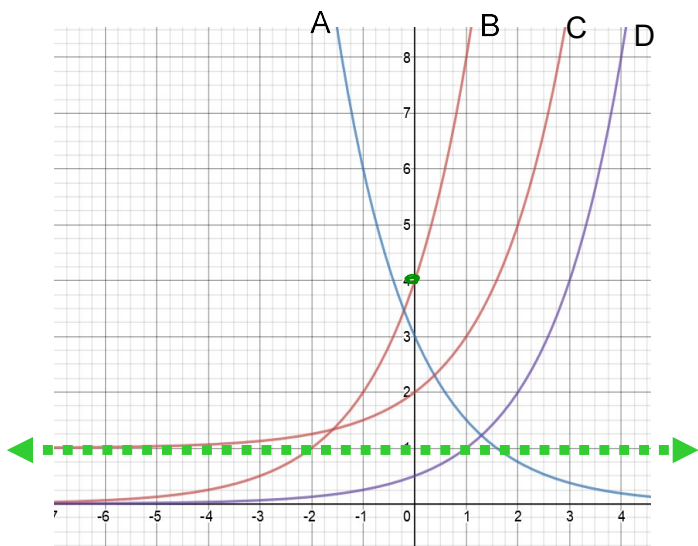
$y= -\left(\frac{1}{2}\right)^x$ —

$y= \left(\frac{1}{3}\right)^x$ —

$y= -\left(\frac{1}{3}\right)^x$ E



Ex. 3



Match the graph with the equation.
There are extra equations.

$y = 4(2)^x$ B

$y = 2^x + 1$ C
 ← Shift UP BY 1

$y = \frac{1}{2}(2)^x$ D
 Same Eqⁿ

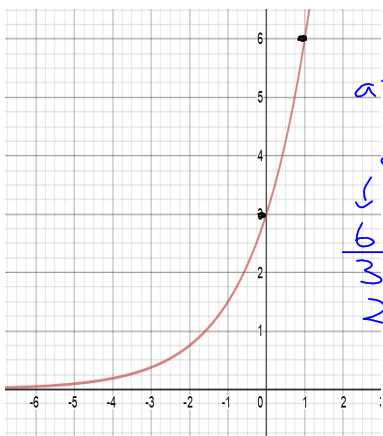
$y = 3\left(\frac{1}{2}\right)^x$ A

$y = 2^{x-1}$ D
 Horiz. Shift Right 1

$y = (-6)^x$ —

$y = 4\left(\frac{1}{2}\right)^x$ —

Ex.4 Write an equation to represent the following graph



$a = 3$ y-int 3
 (1, 6)
 one growth period
 $\frac{6}{3} = b$
 $2 = b$


growth
 Asymptote $y = 0$

$y = ab^x$
 $= 3 \cdot 2^x$
 $\therefore y = 3 \cdot 2^x$

Homework

Pg. 185 # 1,3,4,5,7ac,10

“The greatest shortcoming of the human race is our inability to understand the exponential function.”



Al Bartlett
Professor of Physics
University of Colorado

TransitionWise.org

The image is a rectangular box with a black border. Inside, on the left, is a small square portrait of an elderly man with glasses, wearing a brown jacket over a red shirt. To the right of the portrait is the text 'Al Bartlett' in bold, followed by 'Professor of Physics' and 'University of Colorado' on two lines. In the bottom right corner of the box is the text 'TransitionWise.org'. A red exponential curve starts near the bottom left and curves upwards and to the right, passing behind the text and portrait.