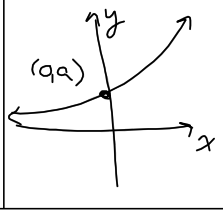
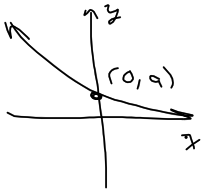
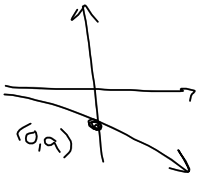
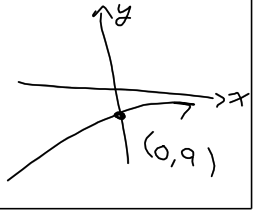
3.4 Properties of Exponential Functions

$f(x)=ab^x$

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

Look fors:

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

	$a>0, b>1$ ex: $a=3$ $b=2$	$a>0, 0<b<1$ $a=2$ $b=\frac{1}{2}$	$a<0, b>1$ $a=-3$ $b=2$	$a<0, 0<b<1$ $a=-3$ $b=\frac{1}{2}$
Transformations	Base $y=b^x$ ∴ V.S. by a	Base $y=b^x$ ∴ V.S. by a	∴ Vert. Refl ∴ V.S. by a	∴ Vert. Refl. ∴ 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 --> 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				

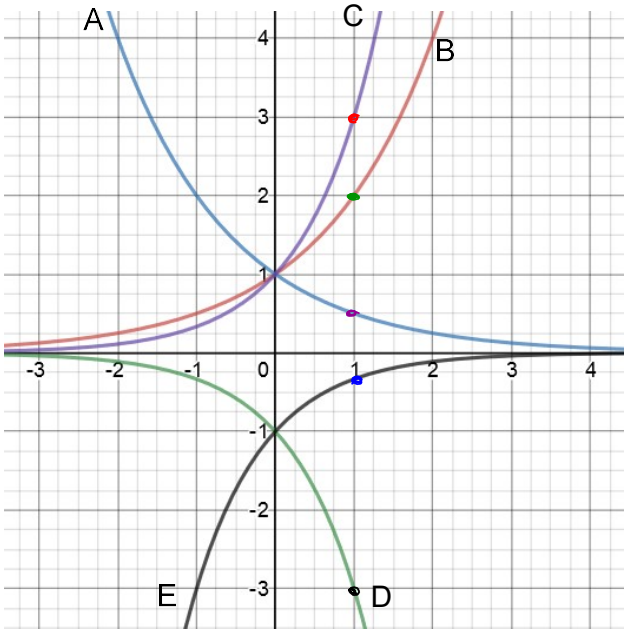
Ex.2 Match the graph with the equation. There are extra equations.

$y=2^x$ B $y=3^x$ C

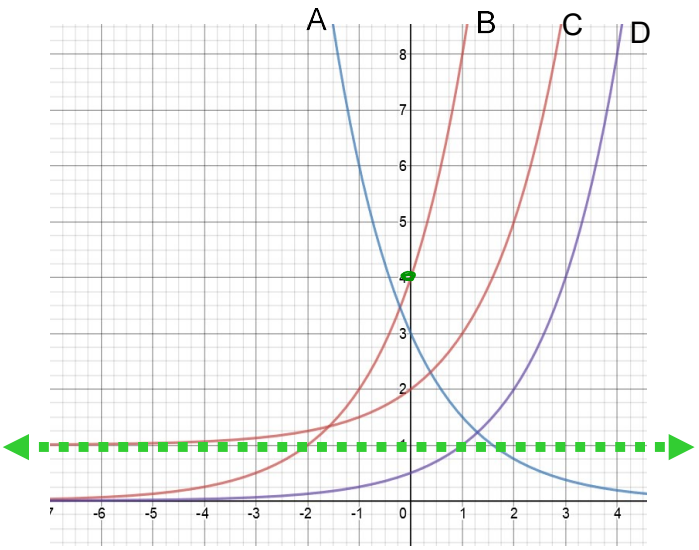
$y=-3^x$ D $y=-2^x$ ___

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

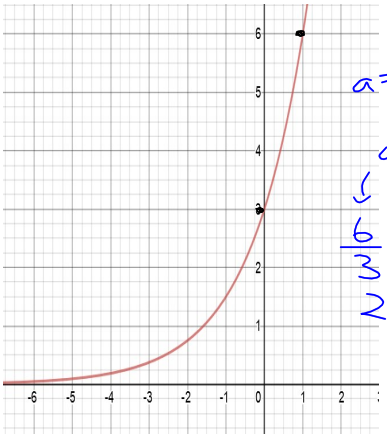
$y = 3\left(\frac{1}{2}\right)^x$ A

$y = 2^{x-1}$ D Hor. Shift Right 3

$y = (-6)^x$ ___

$y = 4\left(\frac{1}{2}\right)^x$ ___

Ex.4 Write an equation to represent the following graph



y-int 3

$a = 3$

(1, 6)

one growth period

growth

Asymptote $y = 0$

$\frac{6}{3} = b$

$2 = b$

$y = ab^x$

$= 3 \cdot 2^x$

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

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