

$\log_a x = y$
 $a^y = x$

Unit 2

Exponents and Logarithms

Exponential

$y=2^x$
 $y=3^x$
 $y=4^x$

Asymptote

2.1 Exponential Functions

Formula Sheet:

Growth/Decay Formula

$$y = ab^{\frac{t}{p}}$$

$y = c^x$

Characteristics of Exponential Mother Functions:

- horizontal asymptote $y = 0$
- no x-intercept
- y-intercept: (0, 1)
- Domain: $x \in \mathbb{R}$
- Range: $y > 0$

Increasing: $b > 1$

Decreasing: $0 < b < 1$

decimal between 0 and 1

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Asymptote

Ex.) Determine the exponential function that goes through the points (0, 1) and (2, 25) in the form $y = b^x$.

$\sqrt{25} = \sqrt{b^2}$

$5 = b$

$y = 5^x$

↑
y-int x, y

Ex.) Determine the exponential function that goes through the points (0, 1) and (-2, 16) in the form $y = b^x$.

$16 = \frac{b^{-2}}{1}$

$b^2 \cdot 16 = \frac{1}{b^2} \cdot b^2$

$b^2 = \frac{1}{16}$

$b = \sqrt{\frac{1}{16}}$

$b = \frac{1}{4}$

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

Exponential
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Transformations of Exponential Functions

Ex.) Sketch and state the characteristics (domain, range, asymptotes, and intercepts) of the following exponential functions:

a) $y = 2^x$

$D: x \in \mathbb{R} (-\infty, \infty)$
 $R: y > 0$
 $x\text{-int: none}$
 $y\text{-int: } (0, 1)$
 $HA: y = 0$

$f(x)$

b) $y = 3(2^x)$

↑ VS of 3

$D: x \in \mathbb{R}$
 $R: y > 0$
 $x\text{-int: none}$
 $y\text{-int: } (0, 3) \rightarrow \text{algebraically}$
 $HA: y = 0$

$y = 3(2^x)$
 $y = 3(2^0)$
 $y = 3$

Exponential
 $y=2^x$
 $y=3^x$
 $y=4^x$
Asymptote

c) $y = 2^x - 4$

↑ VT 4 down

$D: x \in \mathbb{R}$
 $R: y > -4$
 $x\text{-int: } (2, 0)$
 $y\text{-int: } (0, -3)$
 $HA: y = -4$

$f(x) - 4$

d) $y = 2^{2x}$

↑ HS of 1/2

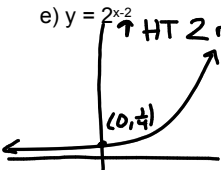
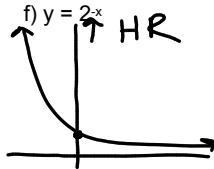
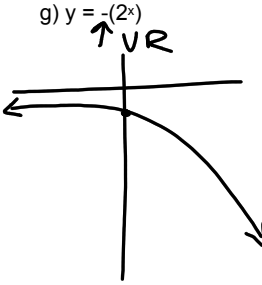
$D: x \in \mathbb{R}$
 $R: y > 0$
 $x\text{-int: none}$
 $y\text{-int: } (0, 1)$
 $HA: y = 0$

$f(2x)$

$\log_a x = y$
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Exponential

 $y=2^x$
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Asymptote

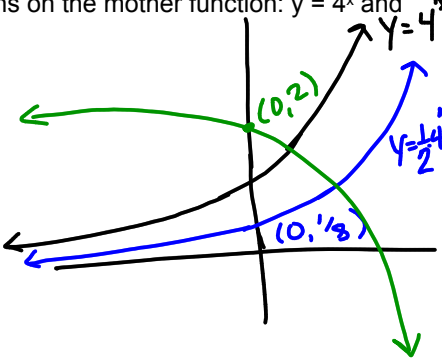
<p>e) $y = 2^{x-2}$ HT 2 right</p> 	<p>D: $x \in \mathbb{R}$ R: $y > 0$ x-int: none y-int: $(0, 1/4)$ HA: $y = 0$</p>	$f(x-2)$
<p>f) $y = 2^{-x}$ HR</p> 	<p>D: $x \in \mathbb{R}$ R: $y > 0$ x-int: none y-int: $(0, 1)$ HA: $y = 0$</p>	$f(-x)$
<p>g) $y = -(2^x)$ VR</p> 	<p>D: $x \in \mathbb{R}$ R: $y < 0$ x-int: none y-int: $(0, -1)$ HA: $y = 0$</p>	$-f(x)$

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Ex.) Describe the combinations of transformations on the mother function: $y = 4^x$ and state the characteristics.

<p>a) $y = \frac{1}{2}(4^{x-1})$</p> <p>VS 1 right</p>	<p>$y = \frac{1}{2}(4^{0-1})$ $y = \frac{1}{2} \cdot \frac{1}{4} = \frac{1}{8}$</p> <p>D: $x \in \mathbb{R}$ R: $y > 0$ x-int: none y-int: $(0, 1/8)$ HA: $y = 0$</p>	
<p>b) $y = -4^{x+3}$</p> <p>VR 3up</p>	<p>D: $x \in \mathbb{R}$ R: $y < 3$ x-int: $(0.79, 0)$ y-int: $(0, 2)$ HA: $y = 3$</p>	

Pg. 342 # 1-5.
Pg. 354 # 3, 4, 7.