MAR 31 2022 MATH 5A

CHAO-MING LIN

Name: Chao-Ming Lin, Department of Mathematics, University of California-Irvine, CA
E-mail address: mailto:chaominl@uci.edu
Office Hours: Monday 8am-9am and Wednesday 2pm - 3pm
Personal Website: https://www.math.uci.edu/~chaominl/

1.4 Exponential Functions

Definition. *Exponential function is one of the form $f(x) = b^x$, where b is a positive constant.*

Proposition. *If a and b are positive numbers and x, y are any real numbers, then*

- $b^{x+y} = b^x \cdot b^y$
- $b^{x-y} = b^x / b^y$
- $(b^x)^y = b^{xy}$
- $(ab)^x = a^x \cdot b^x$

Example. *Check $b^{x+y} = b^x \cdot b^y$ for $b = 2$, $x = 2$, and $y = 1$.*

Solution. First, we have

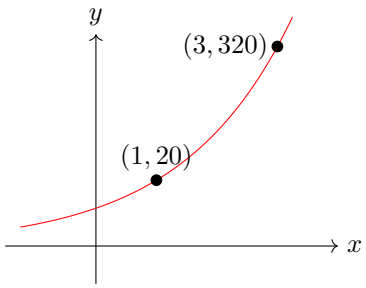
$$\text{Left Hand Side} = b^{x+y} = 2^{2+1} = 2^3 = 8.$$

Then, we get

$$\text{Right Hand Side} = b^x \cdot b^y = 2^2 \cdot 2^1 = 4 \cdot 2 = 8.$$

□

Example (WebAssign #1 Question 14)**.** *Find the exponential function $f(x) = Cb^x$ whose graph is given as follows.*



We have the following system of equations:

$$\begin{cases} 20 = f(1) & = C \cdot b^1 \\ 320 = f(3) & = C \cdot b^3 \end{cases} \Rightarrow 16 = \frac{320}{20} = \frac{C \cdot b^3}{C \cdot b^1} = b^2 \Rightarrow b = 4 \text{ and } C = 5.$$