Contents

1 Problem 1 : Introduction

1.1 Description

F5 : ab^x is an exponential function, where a is a constant value, $a \neq 0$ and it also represents starting (initial) value , b is called base and is a positive real number and $b \neq 1$, x is called the exponent (power), it is independent variable . In this function, b is a constant value, whereas x is variable.

1.2 Domain

The domain for exponential function is the set of real numbers.
$x \in R$, $-\infty < x < \infty$, Domain : $\{x \mid x \in R\}$

1.3 Co-Domain

Co-Domain is the set of all possible function output values.
Suppose $y = f(x) = ab^x$, then $-\infty < y < \infty$, so the range will be $[-\infty, \infty]$.

1.4 Characteristics

- In exponential function, if $b > 0$, then it is known as exponential growth function (increasing function). Its graphical representation shown in the left part of the figure 1.

- In exponential function, if $0 < b < 1$, then it is known as exponential decay function (decreasing function). Its graphical representation shown in the right part of the figure 1.

- Exponential function have horizontal asymptote (i.e function approaches to a imaginary horizontal line but never crosses) at $Y = 0$ (i.e X – axis).

- They are continuous function.

- There is no symmetry in exponential function, so they are neither odd nor even function.

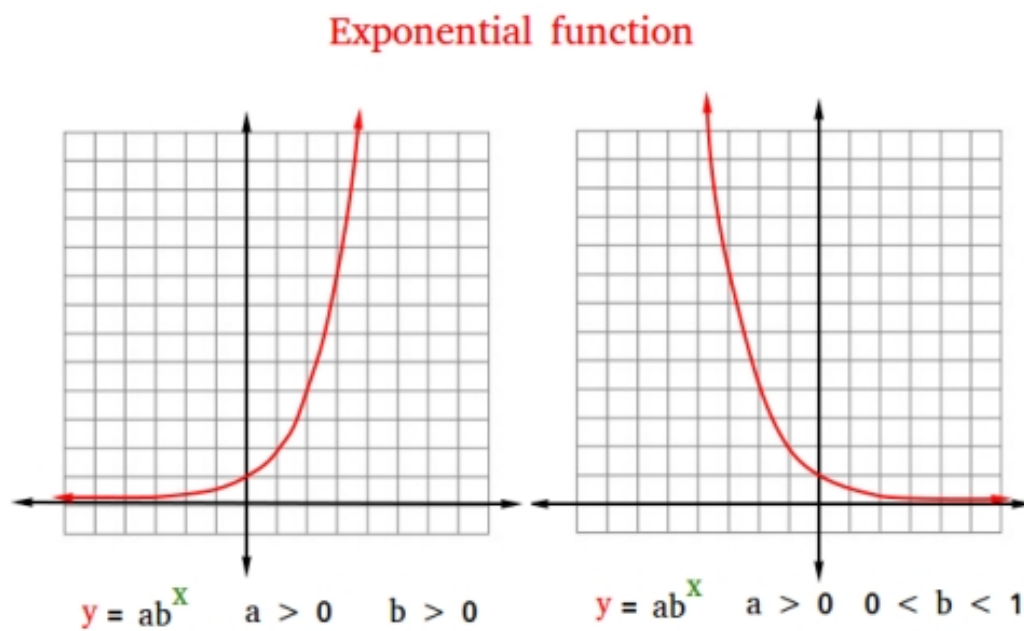- Exponential function is not injective but is surjective.

Figure 1: Exponential Function Graph (Growth And Decay).

1.5 Context of Use Model

Figure 2: Exponential Function Graph (Growth And Decay).

2 Problem 2 : Requirements

1. Requirement 1

   - **ID** : R1
   - **Version** : 1.0
   - **Type** : Functional Requirement
   - **Priority** : High
   - **Difficulty** : Easy
   - **Description** : In the exponential function ab^x, the input value a should be greater than 0 i.e., $a > 0$ (or else it will result in output of the function to be 0 for every input), also input value of base b must be greater than 1 i.e., $b > 1$ (or else if $b = 1$, it will result in output of the function to be 'a' for every input of x).

2. Requirement 2

   - **ID** : R2
   - **Version** : 1.0
   - **Type** : Functional Requirement
   - **Priority** : High
   - **Difficulty** : Easy
   - **Description** : In the exponential function ab^x, the input value of base b must not be negative as it will result will be complex numbers so $b > 0$.

3. Requirement 3

   - **ID** : R3
   - **Version** : 1.0
   - **Type** : Functional Requirement
   - **Priority** : High
   - **Difficulty** : Easy
   - **Description** : : In the exponential function ab^x, the input value of x must be any real number. i.e $x \in R$.

4. Requirement 4

   - **ID** : R4
   - **Version** : 1.0
   - **Type** : Functional Requirement
   - **Priority** : High
   - **Difficulty** : Medium
   - **Description** : The system must take input values of a, b and x from the users and return the output of ab^x function. For example, if $a = 2, b = 3, x = 2$, the output should be 18.

5. Requirement 5

   - **ID** : R5
   - **Version** : 1.0
   - **Type** : Functional Requirement
   - **Priority** : High
   - **Difficulty** : Easy
   - **Description** : If any of the input values a, b or x are not provided by the user, the system should not accept that input and ask user to provide the missing values.

6. Requirement 6

   - **ID** : R6
   - **Version** : 1.0
   - **Type** : Functional Requirement
   - **Priority** : High
   - **Difficulty** : Easy
   - **Description** : If the input values are not of integer type, the system must not accept it and handle the error and ask for integer values as input.

7. Requirement 7

- **ID** : R7
- **Version** : 1.0
- **Type** : Functional Requirement
- **Priority** : Medium
- **Difficulty** : Easy
- **Description** : If the user enters any large input value which the system cannot handle, it should throw an exception and handle it accordingly.