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Function 9 : $f(x, y) = x^y$ Date: 05/07/2019

1 Introduction

F9: $f(x, y) = x^y$ is a power function where x is a base and y is a exponent or power. Here, x and y both are a real variable. This function is one of the most commonly used function in mathematics.

2 Domain & Co-Domain

Lets define function from A to B, represented as $f : A \to B$, where A is the domain and B is the co-domain of the Function.

2.1 Domain

- it includes all the real numbers. To be specific, For $x > 0$, $y \in R$
- $For\ x = 0$, $y \geq 0$.
- $For\ x < 0$, $y \in Q$.

2.2 Co-Domain

- $For\ x > 0$, range is $[0, \infty)$ where $x \in R$ and $y \in R$.
- $For\ x = 0$ and $y = 0$, range is 1 and $For\ x = 0$ and $y > 0$, range is 0.
- $For\ x < 0$, range is $(-\infty, \infty)$ where $x \in R$ and $y \in Z$.

3 Characteristics

- ***Parity*** : This function is neither even nor odd.
- ***Periodicity*** : This function is periodic in y with period
$$\frac{-2\pi}{\log(x) sgn(\log(x))}$$
- **Injectivity & Surjectivity** : This function is not injective which means it is not one-to-one function but it is surjective which means it is onto function.
- ***Commutativity***: This function is not commutative which means $x^y \neq y^x$ for $x \neq y$.

References

[1] Wolframalpha,
`https://www.wolframalpha.com/input/?i=x%5Ey`

[2] TutorialsPoint,
`https://www.tutorialspoint.com/java/lang/math_pow.htm`