CONCORDIA UNIVERSITY

SOEN 6011: Software Engineering Processes

# ETERNITY:FUNCTION F4
# $\Gamma(x)$

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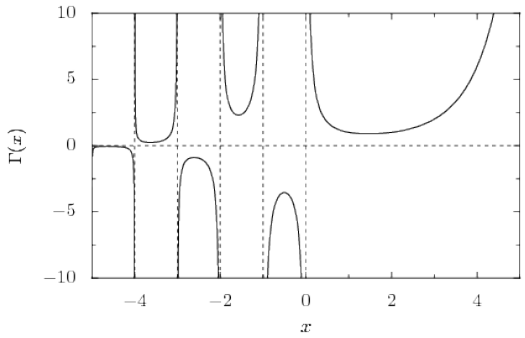


Figure 1: Graph of Gamma Function.[2]

`https://github.com/tavtejS07/SOEN-6011`

# Contents

# 1 Problem 1

## 1.1 Description

Gamma function is said to be an extension of the factorial function used for complex numbers. For any positive integer Gamma function is defined as below.

$$\Gamma(x) = (x-1)\Gamma(x-1) \Rightarrow \Gamma(x) = (x-1)! \tag{1}$$

**Definition:** The function which is improper integral of another function is defined as Gamma function.[1] Using the integral formula below we can define Gamma function. **Note:** For all positive real number x(i.e $Re(x) > 0$), the integral follows absolute convergence.[1] This was derived by **Daniel Bernoulli**.

$$\Gamma(x) = \int_0^\infty t^{x-1}e^{-t}dt \tag{2}$$

## 1.2 Characteristics

1. $\Gamma(x)$ is defined and analytic for it's domain.[1]
2. $\Gamma(x)$ displays the recursive property for $x > 0$. This is displayed in equation 1 above.
3. $\Gamma(x)$ is a meromorphic function, with $\mathbb{Z} \leq 0$ as poles.[2]

## 1.3 Domain

Set of positive real numbers. $x \in \mathbb{R}$ and $x > 0$

## 1.4 Co-Domain

For a specific domain, co-domain for Gamma function is

$$\mathbb{R} > 0 = \{x \in \mathbb{R} | x > 0\}$$

# Bibliography

[1] Libretexts. (2022, February 27). *E14.2: Definition and properties of the gamma function.*Mathematics LibreTexts. Retrieved July 25, 2022, from https://math.libretexts.org/Bookshelves/Analysis/Complex_Variables_with_Applications_(Orloff)/14%3A_Analytic_Continuation_and_the_Gamma_Function/14.02%3A_Definition_and_properties_of_the_Gamma_function

[2] Gamma function. (2011, July 25). *Gamma function*- Knowino. (n.d.). Retrieved July 27, 2022, from https://www.tau.ac.il/ tsirel/dump/Static/knowino.org/wiki/Gamma_function.html