PROBLEM 1. **Dhruviben Modi**
SOEN 6011 **40166396**
SOFTWARE ENGINEERING PROCESSES Due Date: August 5, 2022
Github address : git@github.com:mdhruvi/SOEN-6011-project.git

1 Introduction

F4: $\Gamma(x)$ which is known as Gamma function, is a generalization of the factorial function to non-integer numbers. The gamma function is defined as the improper integral of another function. It is denoted by a capital letter gamma from the Greek alphabet.

Let define f be the Gamma Function from A to B,therefore A is the domain and B is the co-domain of the Gamma Function.

(A)Domain of function: includes all complex numbers and the positive integer(except zero and negative integers).

(B)Co-domain of function:

When n in A is a positive integer, then the gamma function is related to the factorial function $\Gamma(n) = (n-1)!$

When n in A for complex numbers with a positive real part, then the $\Gamma(n) = \displaystyle\int_0^\infty x^{n-1}e^{-x}\,dx$.

2 Properties

[1.] $n \to 0^+, \Gamma(n) \to +\infty$

[2.] Extreme property: a$\in \mathbf{R}$, $\lim_{n\to\infty} \frac{\Gamma(n+a)}{\Gamma(n)n^a} = 1$,

[3.] Density function: $\Gamma\left(n+\frac{1}{2}\right) = \dfrac{(2n)!\sqrt{\pi}}{n!4^n}$

[4.] Recursive property: $\Gamma(n+1) = n * \Gamma(n)$

[5.] Euler's Reflection formula: $\Gamma(n) * \Gamma(1-n) = \frac{\pi}{\sin \pi n}$

[6.] Legendre Duplication formula: $\Gamma(n) * \Gamma(n+\frac{1}{2}) = 2^{1-2n} * \sqrt{\pi} * \Gamma(2n)$

[7.] For $\lambda > 0$, $\int_0^\infty x^{n-1}e^{-\lambda x}\,d = \dfrac{\Gamma(n)}{\lambda^n}$

3 Particular Values

(1) $\Gamma(1) = 0! = 1$
(2) $\Gamma(1/2) = \sqrt{\pi}$

4 References

[En.wikipedia.org] Gamma function https://en.wikipedia.org/wiki/Gamma function

[Course Resource] Function https://www.physics.uoguelph.ca/chapter-2-gamma-function