Individual Report

Software Engineering Process - SOEN 6011

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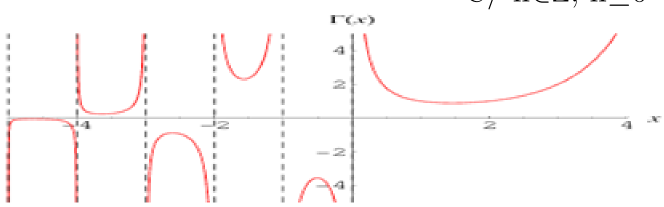
1 Problem 1

Function assigned: (x)
The (complete) gamma function is defined to be an extension of the factorial to complex and real number arguments. It is related to the factorial by

The gamma function is given by this integral for all positive xx. Then there exists an analytic function with domain C\0,−1,−2,. . . , such that its restriction to positive axis coincides with the value of that integral.

C/ n∈Z, n≤0



Properties of the Gamma Function

For any positive real number α:

1. $\Gamma(\alpha) = \int_0^\infty x^{\alpha-1} e^{-x} dx$;
2. $\int_0^\infty x^{\alpha-1} e^{-\lambda x} dx = \frac{\Gamma(\alpha)}{\lambda^\alpha}$, for $\lambda > 0$;
3. $\Gamma(\alpha + 1) = \alpha\Gamma(\alpha)$;
4. $\Gamma(n) = (n-1)!$, for $n = 1, 2, 3, \cdots$;
5. $\Gamma(\frac{1}{2}) = \sqrt{\pi}$.

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2 Problem 2

Requirements

R-1 : When the input for Gamma function is received, the user defined function checks the input if it is 1, then outputs the gamma value as 1.

R-2 : When the input $\frac{1}{2}$ is received, the user defined function checks if the input is equal to $\frac{1}{2}$, if yes outputs the gamma value as $\sqrt{\pi}$.

R-3 : when the input for the program is a non-positive integer, the function which calculates the gamma value discards the input and prints invalid input.

R-4 : When the input (x) is a positive integer, the function validates and returns a gamma value approximate to (x-1)!

3 Problem 3

Algorithm with Stirling's Approximation

This algorithm using sterling's approximation for giving precision. Technically sterling's approximation gives the best precision for any gamma value.

Algorithm A.1 : Calculating Gamma value using sterling's precision

Algorithm 1 My algorithm1

```
procedure CalculateGamma(x)
    stringlen ← length of string
    E ← 2.7182818284
    PI ← 3.1415926535
    loop:
    if string(i) = path(j) then
        j ← j − 1.
        i ← i − 1.
        goto loop.
        close;
    i ← i + max(delta_1(string(i)), delta_2(j)).
    goto top.
procedure squarerootCalc(x)
    if  Val == 0 then return 0
    last ← 0.0
    res ← 1.0
    loop:
    if res == last then
        last ← res.
        res ← (res+2 ÷ res) ÷ 2.
        goto loop.
        close;
    return res
procedure powerCalc(N,x)
    if  x == 0 then return 1
```

Bibliography

[1] http://mathworld.wolfram.com/GammaFunction.html

[2] https://www.probabilitycourse.com/chapter4/$4_{24G}amma_{d}istribution.php$

[3] https://math.stackexchange.com/questions/705103/what-is-the-domain-of-gamma-function