a)

Let:

Therefore, in polar form, can be expressed as:

b)

Since,

Therefore, the real and imaginary parts are 0 and, respectively

Let where

exists at a point if and only if at this point it satisfies the Cauchy-Riemann equation:

Thus, for all points which belong to the line in the -plane lead to existence of

Apply power series for analyzing this problem:

We have:

With , it holds that:

With , it holds that:

Therefore,

Apply power series for analyzing this problem:

We have:

This series valid for all such that

a)

The Laurent series is:

b)

Since we have:

Therefore, the radius of convergence is

Given that:

Let , it holds that:

Taking Laplace transform both sides of , we obtain:

Thus,