a)

Consider the given equation as second order equation with unknown of , solve for we get:

In rectangular form of complex number , we have the formula to take the natural root of a complex number as follow:

With , it holds that:

Therefore,

With , it holds that:

Therefore,

Thus, the given equation has 4 complex roots:

b)

a)

Given that: where

Check whether or not the given function satisfied the Cauchy-Riemann equation:

Therefore, is an analytic function.

We have:

Thus, is an analytic function.

b)

a)

b)

With , solve for in rectangular form by Euler formula:

From :

With , it holds that: (contradiction)

With , it holds that:

Thus, the solution of the equation is:

a)

Given that:

Let , it holds that:

Taking Laplace transform both sides of , we obtain:

Thus, the solution of the given differential equation is:

b)

Form the given information:

Taking

a)

b)

Apply power series for analyzing this problem:

We have:

With , it holds that:

Therefore,

# (Optional)

From the given information we obtain the system of differential equation:

Convert the system form -domain to -domain by Laplace transforms both sides of the system, we get:

From , substitute into , we get:

Thus, the current is: