Answer to Question #85328 – Math – Complex Analysis

Locate and name of the singularities of the following functions in the finite z-plane

Question

1. ln(z+3i)/z^2

Solution

1. $f(z)=\frac{\ln(z+3i)}{z^2}$

This function has two singularities one at z=0 of order 2 and other at z+3i=0 or z=-3i

Z=0 is the pole of order 2.

Function of 1/Z^2 has the singularity at z=0 , pole of order 2

Function of ln(z+3i) has a singularity point at z=-3i, singularity point is branch point.

Question

2. z^2-2z/(z^2+2z+2)

Solution

2. $f(z)=\frac{z^2-2z}{z^2+2z+2}$

$$f(z)=\frac{z(z-2)}{(z+1)^2+1}$$

$$f(z)=\frac{z(z-2)}{(z+1)^2-i^2}$$

$$f(z)=\frac{z(z-2)}{(z+1-i)(z+1+i)}$$

In order to find pole, take denominator equal to zero

Thus, z+1-i=0 and z+1+i=0

Or, z=-1+I and z=-1-i

Function has a singularity of the pole of order 1 at z=-1+I and z=-1-i.