

Q1. Prove or disprove:

1) The function  $\frac{1}{x^2+1+iy^2}$  is entire function.

2)  $Arg(\bar{z}) = -Arg(z)$  for any complex number  $z$ .

Q2.A. Sketch the set of all points  $z$  such that

$$|z| < 1 \text{ or } |-z + 2| < 1 .$$

B. If  $f(z) = \sin x \cosh y + i \cos x \sinh y$ . Find the first derivative of  $f(z)$ .

Q3.A. Show that  $\log z^{\frac{1}{n}} = \frac{1}{n} \log z$  for  $n = 1, 2, 3, \dots$

B. Show that  $\cos z = \cos x \cosh y - i \sin x \sinh y$ .