

Q3. If z_1 and z_2 are two non-zero complex numbers such that

$$|z_1+z_2|=|z_1|+|z_2|,$$

then find $\arg(z_1)-\arg(z_2)$.

Step 1:

For any complex numbers (or vectors), we know:

$$|z_1+z_2|\leq|z_1|+|z_2|$$

Equality holds only when z_1 and z_2 are in the same direction (i.e., they have the same argument/angle).

Step 2:

Given,

$$|z_1+z_2|=|z_1|+|z_2|$$

This means equality holds, so z_1 and z_2 must lie on the same straight line from the origin in the complex plane, pointing in the same direction.

Step 3:

If two complex numbers point in the same direction, then,

$$\arg(z_1)=\arg(z_2)$$

So,

$$\arg(z_1) - \arg(z_2) = 0$$

Answer: 0

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