

1. Given a fixed $a \in \mathbb{C}$. Show that $\frac{|z - a|}{|1 - \bar{a}z|} = 1$ if $|z| = 1$ and $1 - \bar{a}z \neq 0$
2. Find the six distinct sixth roots of $z = -64$.
3. Given a complex number $z \in \mathbb{C}$ and the point P on the unit sphere $S \in \mathbb{R}^3$ corresponding to z under stereographic projection. Show that the antipodal point $-P$ corresponds to $-\frac{1}{\bar{z}}$ under stereographic projection.
4. For each of the following set of points on the unit sphere S in $\mathbb{R}^3$, find an equation that determines the set of corresponding points in the complex plane $\mathbb{C}$ under stereographic projection and describe that set geometrically.
 - (a) $\{(X, Y, Z) \in S \mid X^2 + Y^2 = 1\}$.
 - (b) $\{(X, Y, Z) \in S \mid X^2 + Z^2 = 1\}$.
 - (c) $\{(X, Y, Z) \in S \mid Y^2 + Z^2 = 1\}$.
5. Determine the value(s) of $\log \left[(1 + i)^{2i} \right]$.

Be sure to work out the additional exercises listed on the course homework page
<https://mathweb.ucsd.edu/~jeggers/Math120A/homework.html>