Math 120A
August 3, 2022

Question 1 Stereographic projection is a one-to-one correspondence between

A. $\mathbb{C}$, the complex plane and $S \setminus \{(0,0,1)\}$, the unit sphere minus the north pole.

B. $\mathbb{C}^* = \mathbb{C} \cup \{\infty\}$, the extended complex plane and S, the unit sphere.

C. $\mathbb{R}^3$, 3-dimensional space and $\mathbb{C}^2 = \{(z,w) \mid z,w \in \mathbb{C}\}$, the set of ordered pairs of complex numbers.

*D. **A** and **B**

E. **A**, **B**, and **C**

Question 2 Given $z \in \mathbb{C}$, it's argument $\arg(z)$ is

A. the angle it makes with the positive real axis, with counterclockwise the positive orientation.

B. the set of real numbers t for which $z = |z|e^{i\,t}$.

C. the imaginary part of $\log(z)$, the logarithm of z.

*D. **B** and **C**.

E. **A**, **B**, and **C**.

Question 3 Log(z) is

A. the principal branch of log(z).

B. equal to $\log |z| + i\text{Arg}(z)$, where Arg($z$) is the principal branch of arg(z).

C. a set-valued (multivalued) function because Arg(z) is a set-valued (multivalued) function.

*D. **A** and **B**

E. **A**, **B**, and **C**.

Question 4 Why does $\log(z)$ have branches?

A. e^z is periodic.

B. You have to restrict the domain of e^z to obtain an invertible function.

C. There are many choices for a restricted domain on which e^z is invertible.

D. Because logs come from trees and trees have branches.

*E. **A**, **B**, and **C**.

Question 5 Given $z \in \mathbb{C}$ with $|z| = 1$. Then,

A. $z = e^{i\phi}$ for some real number ϕ.

B. $\dfrac{1}{z} = \bar{z}$

C. $|\mathrm{Re}(z) + \mathrm{Im}(z)| \leq 1$.

*D. **A** and **B**.

E. **B** and **C**.