# Complex Analysis 1, MATH 5510, Spring 2022

## Homework 9, Section III.2

Due Saturday, April 2

**Write in complete sentences!!!** *Explain* what you are doing and convince me that you understand what you are doing and why. Justify all steps by quoting relevant results from the textbook or hypotheses.

**III.2.5.** Derive the formulas

$$\cos z = \frac{e^{iz} + e^{-iz}}{2} \text{ and } \sin z = \frac{e^{iz} - e^{-iz}}{2i}.$$

**III.2.11.** Suppose $f : G \to \mathbb{C}$ is a branch of the logarithm and that $n \in \mathbb{Z}$. Prove that $z^n = \exp(nf(z))$ for all $z \in G$.

**III.2.12.** Prove that the real part of $z^{1/2} = \exp(\frac{1}{2}\log z)$ (where $\log z$ is the principal branch of log) is positive.