Complex Variables, MATH 4337/5337, Fall 2020

Homework 4, 2.12. Functions of a Complex Variable, 2.13. Mappings

Due Tuesday, February 18 at 12:45

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. The exercise numbers are based on the 9th edition of the textbook.

2.14.2. In each case, write the function $f(z)$ in the form $f(z) = u(x, y) + iv(x, y)$. **(a)** $f(z) = z^3 + z + 1$, **(b)** $f(z) = \dfrac{\bar{z}^2}{z}$ where $z \neq 0$.

2.14.4. Write the function $f(z) = z + 1/z$ where $z \neq 0$ in the form $f(z) = u(r, \theta) + iv(r, \theta)$.

2.14.5. Find a domain in the z-plane whose image under the transformation $w = z^2$ is the square domain in the w-plane bounded by the lines $u = 1$, $u = 2$, $v = 1$, and $v = 2$.

2.14.6. **(Graduate)** Find and sketch, showing corresponding orientations, the images of the hyperbolas

$$x^2 - y^2 = c_1 \text{ (where } c_1 < 0) \text{ and } 2xy = c_2 \text{ (where } c_2 < 0)$$

under the transformation $w = z^2$.

2.14.8. Sketch the region onto which the sector $0 \leq r \leq 1$, $0 \leq \theta \leq \pi/4$ is mapped by the transformations **(a)** $w = z^2$, **(b)** $w = z^3$, **(c)** $w = z^4$.