Complex Variables, MATH 4337, Spring 2025

Homework 3: Sections 1.8. Arguments of Products and Quotients, 1.9. Roots of Complex Numbers, 1.10. Examples, Solutions

Due Saturday, February 8 at 11:59 pm

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 class notes, text book, or hypotheses. Use the notation and techniques described in the in-class hints. Do not discuss homework problems with others. If you have any questions, then contact me (`gardnerr@etsu.edu`). The exercise numbers are based on the 9th edition of the textbook.

1.9.5. By writing the individual factors on the left in exponential form, performing the needed operations, and finally changing back to rectangular coordinates, show that:

(a) $i(1-\sqrt{3}i)(\sqrt{3}+i) = 2(1+\sqrt{3}i)$.

1.9.6. Show that if $\text{Re}(z_1) > 0$ and $\text{Re}(z_2) > 0$, then $\text{Arg}(z_1 z_2) = \text{Arg}(z_1) + \text{Arg}(z_2)$.

1.11.2. Find the cube roots of $-8i$, express them in rectangular coordinates, and graph them on the circle $|z| = 2$.

1.11.8. (a) Prove that the usual formula solves the quadratic equation $az^2 + bz + c = 0$ (where $a \neq 0$) when the coefficients a, b, and c are complex numbers. Specifically, by completing the square on the left-hand side, derive the *quadratic formula* $z = \dfrac{-b + (b^2 - 4ac)^{1/2}}{2a}$ where both square roots are to be considered when $b^2 - 4ac \neq 0$.