# Complex Analysis 1, MATH 5510, Fall 2017

## Homework 7, Section III.2

Due: Friday, November 3 at 1:40

**Show all work!!!** Justify every claim and show all computations.

**III.2.1.** Prove that $f(z) = |z|^2 = x^2 + y^2$ does not have a derivative at $z \neq 0$. HINT: Use the definition of derivative and let $h$ approach $0$ along the real axis and the imaginary axis. Compare the results.

**III.2.5.** Derive the formulas

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

**III.2.6.** Describe the sets:

**(d)** $\{z \mid \cos z = 0\}$. HINT: Use formula (2.14) and verify that the only solutions are the real solutions.

**(e)** $\{z \mid \sin z = 0\}$. HINT: Use formula (2.14) and verify that the only solutions are the real solutions.