1. Geometry

- Represent complex numbers, their sums, products, roots and powers, by points in the plane.
- Find and graph the curves in the z = x + iy plane that are mapped into vertical and horizontal lines u = const, v = const in the w = u + iv plane by a function f(z).

Examples: Homework #1: 10. Homework #2: 5,6,14. Homework #3: 3.

2. Computations

- Find cartesian and exponential representation of complex numbers.
- Use cartesian and exponential representation of complex numbers to perform algebra, including finding powers and roots, logarithms, exponentials.
- $\circ\,$ Find harmonic conjugates.

Examples: Homework #1: 1,6,7,10,

Homework #2: 9,13. Homework #3: 2. Homework #4: 6.

3. Basic Definitions

- $\circ~$ Set theory
- $\circ~\epsilon\text{-}\delta$ definition of limits
- $\circ~$ definition of continuity
- $\circ~$ definition of the derivative
- Cauchy-Riemann equations
- \circ harmonic functions

Examples: Homework #2: 7.

4. Simple derivations

- Determine where functions are differentiable. Justify.
- Derive a limit using the definition
- $\circ~$ Show a limit does not exist
- Derive the Cauchy-Riemann equations for differentiable functions
- Derive simple trig identities using rules
- prove simple properties of modulus, complex conjugate for complex exponentials

Examples: Homework #1: 2,3,4,9.

Homework #2: 1,2,3,4,8a,10. Homework #3: 4,5,7. Homework #4: 1,2,3,4.