Complex Numbers - Check your knowledge

□ Are you comfortable with the following algebraic manipulations?

- Addition, subtraction, multiplication, and division of complex numbers;
- Finding the real and imaginary parts and the modulus of combinations of complex numbers;
- Simplifying expressions that involve z and its complex conjugate.
- Going back and forth between polar and Cartesian representations of a complex number;
- Finding the argument, roots, logarithm, exponential, powers of a complex number.
- Given a complex number z, can you evaluate the principal value at z of each of the multi-valued functions we discussed in class?

□ Do you know the definitions of the cosine, sine, hyperbolic cosine and hyperbolic sine of a complex number? Do you know what De Moivre's formula and Euler's formula say? Do you know them well enough to think of using them in a calculation?

□ Do you know what the triangle inequality is?

□ Do you know the definitions of the following concepts: open neighborhood, limit, continuity, and differentiability?

□ Can you calculate limits or derivatives by following different paths in the complex plane?

□ Can you use the definition of continuity to decide whether a function is continuous at a particular point?

□ Can you find the derivative of a function by taking the limit of a difference quotient?

□ Can you calculate derivatives of functions using the chain, product or quotient rules?

□ Do you know the definitions of the following terms: differentiable, analytic, entire?

□ Do you know what the Cauchy-Riemann equations are, and how to apply them to decide whether a function is analytic?

□ Do you know how to check whether a function is harmonic and, if so, do you know how find its harmonic conjugate? Are you able to then write an expression for the resulting analytic function in terms of the complex variable $z = x + i\,y$?