Review for MAT342 Midterm

Definition of complex numbers, their real and imaginary parts and absolute value and argument
Complex Conjugate, Complex numbers in polar form, Euler's formula
Exponential function and its property exp(z + w) = exp(z) exp(w)
epsilon-neighborhood of a complex number and deleted neighborhoods,
Open and closed sets, boundaries and accumulation points
Convex and connected sets, domains and regions
Functions of a complex variable, polynomials and rational functions, mappings
Limits and derivatives, continuity, Analytic functions, Entire functions, Cauchy-Riemann equations
Theorem: A bounded sequence has a convergent subsequence.
Corollary: A continuous real-valued function on a closed bounded set assumes a maximum and a minimum.
Derivatives and integrals of complex valued functions
Rules for differentiation: derivatives of sum, difference, product and quotient of functions. Chain rule
Theorem: If a function has real and imaginary parts that have continuous partial derivatives and satisfy the Cauchy-Riemann equations, then it is analytic.
Harmonic functions, The real and imaginary parts of an analytic function are harmonic. harmonic conjugates
Logarithm function and trig. functions of complex variables and their derivatives, hyperbolic functions, complex exponents
Contours and contour integrals.
Prove that the absolute value of a contour integral is bounded by the maximum absolute of the function times the length of the contour.
Use Green's theorem to prove the Cauchy-Goursat theorem
Compute the value of the contour integral of 1/z over a circle around the origin.
Find the integral of z^n over the same circle where n is a natural number.