3450:438/538:001 **Homework 4** Fall 2007

Course: Advanced Engineering Math I
Instructor: Dr. Laura Gross
Due date: Wednesday, September 19, 2007

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1. Find dw/dz for $w = \sin[\exp(2z)]$.

2. Use the Cauchy-Riemann equations to prove that $w = \bar{z}$ is not differentiable on the whole complex plane.

3. Show that $f(z) = x^3 - 3xy^2 + i(3x^2y - y^3)$, where $z = x + iy$, is differentiable. Write this function in terms of z, recalling that $x = \dfrac{z + \bar{z}}{2}$, and $y = \dfrac{z - \bar{z}}{2i}$.

4. Prove or disprove that S is a vector space over $\mathbb{R}$ if S is the set of all 2×3 matrices with non-negative components.

5. Prove or disprove that S is a subspace of the vector space $\mathbb{C}^4$ if S is the set of all ordered complex quadruples of the form $(x, y, 0, x + y)$.

6. Prove or disprove that S is a subspace of the vector space $\mathcal{C}[a, b]$ if S is the set of all continuous functions on the interval $[a, b]$ such that $f(b) = f(a) + 3$.