

# 3450:438/538:001    **Homework 1**    Fall 2007

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**Course:** Advanced Engineering Math I

**Instructor:** Dr. Laura Gross

**Recommended deadline:** Wednesday, August 29, 2007

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**THIS HOMEWORK IS NOT FOR COURSE CREDIT.** However, you need to do problems to learn the material. Also, about 1/3 of your exam will consist of recommended homework problems.

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Each answer must use **exact values**. (Do not give only decimal approximations to answers.) Show your work. Recall you can check many of your answers using the complex-variables capabilities of your graphing calculator.

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1. Write the numbers in the form  $a + bi$ .

(a)  $\frac{(8 + 2i) - (1 - i)}{(2 + i)^2}$

(b)  $\left[ \frac{2 + i}{6i - (1 - 2i)} \right]^2$

(c)  $(2 + i)(-1 - i)(3 - 2i)$

2. Verify by substitution that  $-1 + i$  and  $-1 - i$  are solutions to  $x^3 - 2x - 4 = 0$ .

3. Write the complex equation  $z^3 = 1$  as two real equations.

4. Write the system of two complex equations  $z^3 + v^2 = 4i$ ,  $v - 2i + 3 = 0$  as four real equations.

5. Prove  $\Re(iz) = -\Im(z)$  for all complex numbers  $z$ . (Hint: Write  $z$  as  $x + iy$ .)

6. Briefly explain why  $z_1 < z_2$  is not a meaningful statement for  $z_1, z_2 \in \mathbb{C}$ .