

**Math 185 HW#1, due 9/4/12 at 12:40 PM**

Since we have not introduced much material yet, the following exercises are elementary (although not always easy) and intended to give you practice with the algebra and geometry of complex numbers. There will be some analysis starting with the next assignment.

- Calculate  $(1 - i)^9$ .
  - Find all square roots of  $3 + 4i$ .
  - Calculate  $(\sqrt{3} + i)^{12}$ .
- Let  $a$  and  $b$  be distinct complex numbers. If  $a$  and  $b$  are opposite vertices of a square in the complex plane, what are the other two vertices?
- Gamelin, page 5, exercises 3, 5, 6, and 7.
- Gamelin, page 10, exercise 6.
- Gamelin, page 14, exercise 2.
- Let  $a_1, a_2, a_3$  be distinct complex numbers. Show that  $a_1, a_2, a_3$  are the vertices of an equilateral triangle if and only if

$$a_1^2 + a_2^2 + a_3^2 = a_1a_2 + a_2a_3 + a_3a_1.$$

*Hint:* Relate both conditions to the condition

$$\frac{a_3 - a_2}{a_2 - a_1} = \frac{a_1 - a_3}{a_3 - a_2}.$$

- Extra credit:* Find all solutions to the equation  $z^5 = 1$ , without using any trig functions.