Math 421 **Problem Set 2** **Fall, 2006**

Due: Friday, Sept. 22

1. Do page 21, Exercise 6, (b) and (c).

2. Do page 30, Exercise 7. Also find $\arg(z_1)$ and two different polar forms for z_2. (Note: In the polar form $r\,e^{i\,\theta}$ for a complex number, we require $r \geq 0$.)

3. Do page 37, Exercise 2.

4. Do page 37, Exercise 4.

5. (a) With paper and pencil calculations, find the 6th roots of unity, each in the form $a + b\,i$.

   (b) Repeat (a) but using MATHEMATICA.

   (c) Indicate which one is the *primitive* 6th root of unity, and why.

   (d) Plot all six of them by using Park's `ComplexGraphics` function. In your plot display the points (made big enough to see readily) as well as line segments that "connect the dots" to form a polygon.

6. Find the 6th roots of $64 + 64i$. Leave your answers as exact expressions and not as numerical approximations.

7. (**Extra credit**) Do page 38, Exercise 12. [*Hints:* The nth roots of unity are the zeros of the polynomial $z^n - 1$; what, then, does the factor theorem say about $z^n - 1$? Also, how else can you write $z^n - 1$ by factoring out $z - 1$?]