Math 333-01  Homework 3  Monday, September 8, 2013

Directions: Carefully write the solutions to all the problems showing all steps and work. Please submit a neat document. Do not write answers in decimal form - use whole numbers or fractions.

Section 1.6.1

1. Evaluate \((1 + \sqrt{3}i)^9\) using complex exponential form and then write the answer in \(a + bi\) form.

2. Compute the roots of: \((-1 + \sqrt{3}i)^{1/2}\)
   (a) Use complex exponential form
   (b) Covert to \(a + bi\) form
   (c) Sketch in the complex plane
   (d) What is the principal root?

3. (a) Find four solutions in complex exponential form to:

   \[
   \frac{d^4 y}{dt^4} + 2 \frac{dy}{dt} = 0. 
   \]

   Hint: You can assume the solutions are of the form \(y = e^{mt}\) and obtain an algebraic equation for \(m\), which you then need to solve.

   (b) State 4 real functions that are solutions of the ODE by using the real and imaginary parts of the solutions in (a).

Section 1.6.3

4. Sketch and identify the following in the complex plane:
   (a) \(\text{Re}(z) < -1\)
   (b) \(|z - 3i| = 2\)
   (c) \(\text{Im}(\bar{z} + 3i) = 6\)
   (d) \(1 \leq |z + i| < 2\)
   (e) \(0 \leq \arg(z) \leq \pi/6\)
Section 2.1.1

5. Express the given functions in the form $f(z) = u(x, y) + iv(x, y)$

(a) $f(z) = z + 1/z$
(b) $f(z) = 3\bar{z}^2 + 2z$