Complex Analysis

Math 312 — MWF 10:30-11:25am

Spring 1996 — 201 Fowler

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Homework Set 2

ASSIGNED: Mon Feb 4 — **DUE: Fri Feb 11**

1. On page 20 in the text *Churchill & Brown* do: **1, 2, 13 and 14.**
2. Solve the following equations

   (a) $\dfrac{z}{1-z} = 1 - 5i$

   (b) $iz = 4 - zi$

   (c) $8z^2 + (2-i)z = 0$

   (d) $z^2 + 2z + (1-i) = 0$

3. Find z_1 and z_2 and write the answers in *exponential form*

$$\begin{aligned}(1-i)z_1 + 3z_2 &= 2 - 3i \\ iz_1 + (1+2i)z_2 &= 1\end{aligned}$$

4. Find all complex numbers z such that $(z+1)^5 = z^5$.
5. Is 2.20 an algebraic number? Prove it.
6. Compute the following roots and state which is the principal root in each case.

   (a) $(-16)^{1/4}$

   (b) $\sqrt{i-1}$

   (c) $(1 - i\sqrt{3})^{1/3}$

7. Give sketches representing the following regions in the complex plane

   (a) $|z - 2 + i| \leq 1$

   (b) $|2z + 3| > 4$

   (c) $\text{Im } z > 1$

   (d) $\text{Im } z = 1$

   (e) $0 \leq \arg z \leq \pi/4 \qquad (z \neq 0)$

   (f) $|z - 4| \geq |z|$

   (g) $(\text{Re } z)^2 > 1$

   (h) $0 < |z - 2| < 3$

8. Using your answers to the previous question, answer the following.

   (a) Which of the sets are *open*?

   (b) Which of the sets are *bounded*?

   (c) Which of the sets are *domains*?

   (d) Describe the boundary of each set.

9. On page 32 in the text *Churchill & Brown* do: **1**

10. Write each of the following functions in the form $f(z) = u(x, y) + iv(x, y)$

    (a) $f(z) = z^3 + z + 1$

    (b) $f(z) = \dfrac{1}{z}$

    (c) $f(z) = e^{3z}$

    (d) $f(z) = \dfrac{z+i}{z^2+1}$

NOTES

All homework sets will be due in class *at least* one week from the class they are given out in. You are strongly encouraged to work together on the homework.