

HOMEWORK 2, DUE FRIDAY, JANUARY 31

Please turn in solutions for the following problems:

- (1) Sketch each set and determine if each set is open, closed, connected, or bounded:

(a)  $\operatorname{Re}(z) > \operatorname{Im}(z)$

(b)  $1 < |z| < 2$

(c)  $|2z - 4 + 6i| \leq 4$

(d)  $0 \leq \arg(z) \leq \pi/4$

(e)  $(\operatorname{Re}(z))^2 + 1 = (\operatorname{Im}(z))^2$

- (2) For each of the following functions, determine the largest possible domain of definition.

(a)  $f(z) = \frac{1}{z^2 + 1}$

(b)  $f(z) = \frac{z}{z - \bar{z}}$

(c)  $f(z) = \frac{1}{1 - |z|^2}$

(d)  $f(z) = \operatorname{Arg}\left(\frac{1}{z}\right)$

- (3) Consider the function  $f(z) = (1 + i)\bar{z}$ , and let  $S$  be the horizontal line  $\operatorname{Im}(z) = 1$ . Sketch the image set  $f(S)$ .

- (4) Consider the function  $f(z) = \operatorname{Arg}(z)$ , and let  $S$  be the horizontal line  $\operatorname{Im}(z) = 1$ . Sketch the image set  $f(S)$ .

In addition, I suggest that you work these problems from the Brown/Churchill textbook (but do not turn in):

- Page 33, problems 1, 2, 3
- Page 44, problems 3, 4, 7