

Complex Variables, MAT 3223  
Examination, March 1, 1994  
Instructor: D. Gokhman

Name: \_\_\_\_\_

1. (40 pts.) For the following functions  $f(z)$  find the largest subset of the complex plane, where  $f(z)$  is continuous.

(a)  $f(z) = 1/(z^2 + z + 1)$

(b)  $f(z) = 1/(z^4 + 8iz)$ .

2. (50 pts.) Sketch each of the following sets  $S \subseteq \mathbf{C}$ . Is  $S$  open? closed? connected? Sketch  $f(S)$  — the image of  $S$  under the indicated mapping  $f(z)$ .

(a)  $S = \{z \in \mathbf{C}: |z| < 1, |\operatorname{Re} z| \neq |\operatorname{Im} z|\}$ ,  $f(z) = (1 + i)z$

(b)  $S = \{z \in \mathbf{C}: |z| \leq 1/2, |z - 1| < |z + 1|\}$ ,  $f(z) = z^3$

3. (40 pts.) Sketch the set of points in the complex plane, where the following functions  $f(z)$  are complex differentiable? Find the derivative  $f'(z)$  at these points.

(a)  $x^3 + iy^3$

(b)  $|z|^2$

1	2	3	total (130)