

5-8

**MAPPING OF CURVES**

Find and sketch or graph the images of the given curves under the given mapping.

5.  $x = 1, 2, 3, 4, \quad y = 1, 2, 3, 4, \quad w = z^2$

6. **Rotation.** Curves as in Prob. 5,  $w = iz$

7. **Reflection in the unit circle.**  $|z| = \frac{1}{3}, \frac{1}{2}, 1, 2, 3,$   
 $\text{Arg } z = 0, \pm\pi/4, \pm\pi/2, \pm3\pi/2$

8. **Translation.** Curves as in Prob. 5,  $w = z + 2 + i$

9. **CAS EXPERIMENT. Orthogonal Nets.** Graph the orthogonal net of the two families of level curves  $\text{Re} f(z) = \text{const}$  and  $\text{Im} f(z) = \text{const}$ , where (a)  $f(z) = z^4$ , (b)  $f(z) = 1/z$ , (c)  $f(z) = 1/z^2$ , (d)  $f(z) = (z + i)/(1 + iz)$ . Why do these curves generally intersect at right angles? In your work, experiment to get the best possible graphs. Also do the same for other functions of your own choice. Observe and record shortcomings of your CAS and means to overcome such deficiencies.

10-14

**MAPPING OF REGIONS**

Sketch or graph the given region and its image under the given mapping.

10.  $|z| \leq \frac{1}{2}, \quad -\pi/8 < \text{Arg } z < \pi/8, \quad w = z^2$

11.  $1 < |z| < 3, \quad 0 < \text{Arg } z < \pi/2, \quad w = z^3$

12.  $2 \leq \text{Im } z \leq 5, \quad w = iz$