Panel 1

Homework

① Describe in words the mapping properties of
$f(z) = 2e^{i\frac{3\pi}{4}} \cdot z + (3+i)$

② Does $f(z) = e^{-z}$ map the half-strip $Re(z) > 0$ and $-\pi/2 < Im(z) < \pi/2$ onto the portion of the right half plane that lies inside or outside the unit disk? You could use the zMap program for this.

③ Let $f(z) = (1+i)z$. Find image of the triangle with vertices $z_1 = 1+i$, $z_2 = -1+i$, $z_3 = -\sqrt{2}\,i$ algebraically and geometrically

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Panel 2

1. Sketch the following sets and determine which are domains (*):

(a) $|z - 2 + i| \le 1$;
(b) $|2z + 3| > 4$;
(c) $\operatorname{Im} z > 1$;
(d) $\operatorname{Im} z = 1$;
(e) $0 \le \arg z \le \pi/4$ $(z \ne 0)$;
(f) $|z - 4| \ge |z|$.

2. Which sets in Exercise 1 are neither open nor closed?

3. Which sets in Exercise 1 are bounded? (**)

7. Determine the accumulation points of each of the following sets:

(a) $z_n = i^n$ $(n = 1, 2, \ldots)$;
(b) $z_n = i^n/n$ $(n = 1, 2, \ldots)$;
(c) $0 \le \arg z < \pi/2$ $(z \ne 0)$;
(d) $z_n = (-1)^n(1+i)\dfrac{n-1}{n}$ $(n = 1, 2, \ldots)$.

8. Prove that if a set contains each of its accumulation points, then it must be a closed set.

(*) A set is a domain if it is open and connected.

(**) A set S is bounded if $S \subset D_R(0)$ for some R.

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