1. (a) $z = 1 + \left(\cos\left(\frac{\pi k}{8}\right) + i\sin\left(\frac{\pi k}{8}\right)\right)$ for $k = 0, 1, 2, 3$.
   (b) $\exp(3\log 2 - \frac{\pi}{2} + i(\frac{3\pi}{2} + \log 2))$.
   (c) 0.

2. True; first use definition of uniform convergence, then with upper-bound considerations, use ratio test to see $\sum \frac{\sqrt{n}\cdot 2^n}{n!}$ converges absolutely on $\overline{D_2(0)}$. By Cauchy Criterion for infinite, series, the result follows.

3. (a) Not entire; write $u(x, y) = x^2 + y^2$ and $v(x, y) = 0$ and look at the Cauchy-Riemann equations.
   (b) Not entire; Cauchy-Riemann equations are not satisfied.

4. (a) (DRAWINGS).
   (b) S is compact; S is bounded and closed, so by Heine-Borel, S is compact.
   (c) Consider $f_M(z) = z + 3$, where $M = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$ and $\det M = 1 \neq 0$.

5. $\frac{2\pi\cdot 16}{5}$.

6. Seek to use Louisville's theorem, but not sure on how to show that $|f|$ is bounded.

7. this follows from maximum modulus principle.

8. Use Rouche's theorem (try to use maximum modulus principle to show $|f(z)| < 1$ on the unit circle?).

9. Gamma function (Γ)?

10. $-\frac{\pi}{5}$ (hopefully my arithmetic is correct).