1. (30 pts.) Suppose $z_1, z_2, z_3$ belong to the unit circle and $z_1 + z_2 + z_3 = 0$. Prove that the triangle with vertices $z_1, z_2, z_3$ is equilateral.

2. (20 pts.) Suppose $f(z)$ is entire. Prove that so is $\overline{f(z)}$.

3. (30 pts.) Consider the map $f(z) = \frac{1}{z}$. Determine (with proof) the images of the lines $\text{Re } z = 0$ and $\text{Re } z = 1$. Sketch.

4. (40 pts.) Consider the power series
   \[ \sum_{n=1}^{\infty} \frac{z^n}{n^2}. \]
   (a) Find the radius of convergence.
   (b) Prove that convergence is uniform within the radius of convergence.

5. (40 pts.)
   (a) Find a parametrization for the straight line segment from 0 to $2 + i$.
   (b) Integrate $\text{Im } z$ along this segment.

6. (40 pts.) Calculate the following curve integrals:
   (a) $\int_{\gamma} \frac{dz}{(z^2 - 1)^3}$, where $\gamma$ is circle of radius 5 centered at 0.
   (b) $\int_{\gamma} \frac{\sin z dz}{z^4}$, where $\gamma$ is: \[ Y \] \[ X \]