1. Prove the following statements from §1.1.1
   (a) $z \in \mathbb{C}$ is purely imaginary if and only if $z = -\bar{z}$
   (b) $\mathrm{Re}(z) = \frac{z+\bar{z}}{2}$
   (c) $\mathrm{Im}(z) = \frac{z-\bar{z}}{2i}$
   (d) $|z|^2 = z\bar{z}$
   (e) If $z \neq 0$, then $\frac{1}{z} = \frac{\bar{z}}{|z|^2}$.
   (f) If $z = re^{i\theta}$, then $\bar{z} = re^{-i\theta}$.
2. Use Taylor Series from Calculus II to prove Euler's Formula: $e^{i\theta} = \cos\theta + i\sin(\theta)$.
3. Use the definition of complex multiplication to prove that if $z = re^{i\theta}$ and $w = se^{i\varphi}$ then $zw = rse^{i(\theta+\varphi)}$.
4. Prove the following statements from §1.1.2
   (a) An infinite sequence of complex number $\{z_n\}$ converges to $w \in \mathbb{C}$ if and only if the sequence of real and imaginary parts of z_n converge to the real and imaginary parts of w, respectively.
   (b) $\mathbb{C}$ is complete.
5. Prove the following statements from §1.1.3
   (a) The union of two closed sets is closed.
   (b) The intersection of two closed sets is closed.
   (c) A finite union of points in $\mathbb{C}$ is closed.
6. Give an example of an infinite union of closed sets in $\mathbb{C}$ that is not a closed set.
7. Book Problem #5 page 25.