1. (25 Points) Compute the following:
   (a) \((3 + 4i)(5 - 2i)\)
   
   (b) \(\frac{3 + 4i}{5 - 2i}\)
   
   (c) \((1 - \sqrt{3}i)^{14}\)
   
   (d) \(\frac{|(3 + 4i)^4|}{|3 - 4i|^5}\)
   
   (e) \(e^{\frac{3\pi}{6}i}\)
   
   (f) \(\text{arg}(-\sqrt{3} + i)\)
   
   (g) \(\text{Re}[(2 + 3i)(x + yi)]\)
2. (10 Points) Find all cube roots of $-27$.

3. (15 Points) Show that for real numbers $x$ and $y$ that $|e^{x+iy}| = e^x$. 
4. (10 Points) What is the image of the disk \(|z - i| < 2\) under the map \(f(z) = (3 + 4i)z + 2\)? Draw pictures.

5. (10 Points) Draw pictures of the following sets of complex numbers.
   (a) \(|z - 2 + 3i| < 4\)

   (b) \(1 < |z| < 4\)
6. (20 Points) Let $D$ be the domain defined by $|z| < 3$ and $0 < \text{Arg}(z) < \pi/2$ and let $h$ be the function $h(z) = 2z^3$.

(a) Draw a picture of $D$.

(b) Find the image $h[D]$ and draw a picture of it.
7. (10 Points) Let $f: \mathbb{C} \rightarrow \mathbb{C}$ be a complex valued function.
   
   (a) State the definition of what it means for $f$ to be differentiable at $z_0$.

   (b) Using the definition of being differentiable find the derivative of $f(z) = z^3$. 