1. Calculate the following natural (base $e$) logarithms. Give three distinct answers for each, including a real-valued answer if one exists. Express your answers in Cartesian form, and show your work.

   (a) $\log(e^5)$
   (b) $\log(-e)$
   (c) $\log(-42)$
   (d) $\log(-i)$
   (e) $\log\left(\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}i\right)$

2. Calculate the common (base 10) logarithm of $-100$. Show your work. Hint: remember that in general, $\log_b(x) = \frac{\log(x)}{\log(b)}$ for any base $b$.

3. We can even use negative or imaginary bases for logarithms. Perhaps we could call base $-10$ logarithms uncommon, base $-e$ logarithms unnatural, and base $-i$ logarithms unreal.

   (a) Calculate the unnatural logarithm $\log_{-e}(e)$. Show your work.
   (b) Calculate the uncommon logarithm $\log_{-10}(-100)$. Show your work.
   (c) Calculate the unreal logarithm $\log_{-i}(-1)$. Show your work.

4. Calculate the two square roots of $-i$, and express them in both polar and Cartesian form, showing your work. Draw a picture of $-i$ and its roots as vectors in the complex plane, as accurately as you can. Hint: first rewrite $-i$ itself in polar form.

5. Calculate all distinct cube roots of $z = -4\sqrt{2} + 4\sqrt{2}i$, showing your work. Do this by first rewriting $z$ in polar form, and then calculating $z^{\frac{1}{3}}$. Express your final answers in polar form, with all phases as rational multiples of $\pi$. Draw a picture of $z$ and its roots as vectors in the complex plane, as accurately as you can.

6. Figure 1.6 on page 19 of our textbook isn’t quite right. Briefly describe why the figure is inaccurate, and explain how to fix it.

7. Figure 1.10 on page 24 is also not right. Briefly describe why the figure is inaccurate, being as specific as you can, and draw the figure as it should appear.

8. Calculate the sixth roots of unity (that is, $\sqrt[6]{1}$), expressing each root in polar form, and draw them as vectors in the complex plane, as accurately as you can.