Complex Analysis Worksheet

Write a program in Python to find the following:

1. Construct a menu driven calculator for the following operations to be performed on complex numbers:

   1 : Sum (two numbers)
   2 : Difference (two numbers)
   3 : Conjugate
   4 : Polar form
   5 : Plot the number entered on the X-Y plane
   6 : Plot the number entered on the Argand plane
   7 : Modulus
   8 : Amplitude
   9 : Real part
   10 : Imaginary part

2. Verify the following for two complex numbers $z_1 = 5 - 7i$ and $z_2 = 4 + i$:

   (a) $|z_1 z_2| = |z_1||z_2|$
   (b) $|z_1 + z_2| \leq |z_1| + |z_2|$
   (c) amp$(z_1 z_2)$=amp(z_1)+ amp(z_2)
   (d) amp $\left(\frac{z_1}{z_2}\right)$=amp$(z_1)$ - amp(z_2)

3. Evaluate $e^{2n\pi i}$ for any three values of n.

4. Find the locus such that $|z-1|^2 + |z+1|^2 = 4$.

5. Check whether $f(z) = logz$ is analytic. If yes, then find $f'(z)$

6. Verify whether $f(z) = z - \bar{z}$ is differentiable using the C-R equations.

7. For the complex number $z = 3 + 3i$, plot the following in the same X-Y plane:

   (a) Reflection with respect to the Y-axis.
   (b) Translation by $c = 1 + 2i$.

8. For the complex number $z = 5 - 2i$, plot the following in the same argand plane:
   (a) Magnification by $A = 4e^{i}$ with respect to the Y-axis.
   (b) Inversion by $A = 2$.
9. Find the points at which the functions $w_1 = cosz$ and $w_2 = \frac{1}{2}\left(z + \frac{1}{z}\right)$is not conformal.
10. Find the fixed points of the transformation $w = \frac{3z-4}{z}$.