MATH 417 **Homework 1**
Instructor: D. Cabrera **Due June 18**

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1. Find the modulus and conjugate of each complex number below.
   (a) $-2+i$
   (b) $(2+i)(4+3i)$
   (c) $\dfrac{3-i}{\sqrt{2}+3i}$

2. Express each complex number below in exponential form. In each case, use the principal argument of the number.
   (a) $2i$
   (b) $1+i$
   (c) $-2+i\sqrt{12}$

3. Use DeMoivre's Theorem to expand $(1+i)^6$. Write your answer in the form $a+bi$.

4. Show that $\overline{e^{i\theta}} = e^{-i\theta}$.

5. Find all solutions to $z^4 = -16$.

6. Solve the equation
$$z^{4/3} + 2i = 0$$
   for z and plot the roots in the complex plane.

7. Write the function $f(z) = z^3 + z + 1$ in the form $f(x, y) = u(x, y) + i\,v(x, y)$.

8. Suppose that $f(z) = x^2 - y^2 - 2y + i(2x - 2xy)$, where $z = x + iy$. Use the expressions
$$x = \frac{z+\bar{z}}{2}, \quad y = \frac{z-\bar{z}}{2i}$$
   to write $f(z)$ in terms of z and simplify the result.

9. Find the image of the semi-infinite strip $x \geq 0$, $0 \leq y \leq \pi$ under the transformation $w = e^z$ and label corresponding portions of the boundaries.