1. Write the number in the form $a + bi$ with $a, b \in \mathbb{R}$.
   \[
   \frac{3}{i} + \frac{i}{3}, \quad (2 + i)(-1 - i)(3 - 2i).
   \]

2. Let $z$ be a complex number such that $\Re z > 0$. Prove that $\Re (1/z) > 0$.

3. Evaluate
   \[
   3i^{11} + 6i^3 + \frac{8}{i^{20}} + i^{-1}\]

4. Describe the set of points in the complex plane that satisfies each of the following
   \[
   \Im z = 2, \quad |2z - i| = 4, \quad |z| = \Re z + 2, \quad |z| = 3|z - 1|, \quad |z - i| < 2.
   \]

5. Prove that if $(\overline{z})^2 = z^2$, then $z$ is either real or purely imaginary.

6. Decide which of the following statements are true.
   (a) Arg $z_1z_2 = \text{Arg } z_1 + \text{Arg } z_2$ if $z_1 \neq 0$ and $z_2 \neq 0$.
   (b) Arg $\overline{z} = -\text{Arg } z$ if $z$ is not a real number.

7. Write each of the given numbers in the form $a + bi$ with $a, b \in \mathbb{R}$.
   \[
   \exp(-i\pi/4), \quad \frac{\exp(1+i3\pi)}{\exp(-1+i\pi/2)}, \quad \exp(\exp i)
   \]

8. Write each of the given numbers in the polar form $r \cos \theta + ir \sin \theta$.
   \[
   \left(\cos \frac{2\pi}{9} + i \sin \frac{2\pi}{9}\right)^3, \quad \frac{2+2i}{-\sqrt{3}+i}, \quad \frac{2i}{3\exp(4+i)}
   \]

9. The function $\gamma(t) = \exp(it)$, $0 \leq t \leq 2\pi$ describes the unit circle traversed in the counter-clockwise direction. Describe each of the following curves.
   (a) $\gamma(t) = 3 \exp(it)$, $0 \leq t \leq 2\pi$
   (b) $\gamma(t) = 2 \exp(it) + i$, $0 \leq t \leq 2\pi$

10. Use the identity $[r(\cos \theta + i \sin \theta)]^n = r^n(\cos n\theta + i \sin n\theta)$ for any positive integer $n$ to show that $(\sqrt{3} - i)^7 = -64\sqrt{3} + i64$.

11. Write each of the following functions in the form $w = u(x, y) + iv(x, y)$.
   (a) $f(z) = 3z^2 + 5z + i + 1$
   (b) $h(z) = \frac{z+i}{z^2+1}$
   (c) $F(z) = \exp(3z)$

12. Show that the function Arg $z$ is discontinuous at each point of the non-positive real axis.

13. Prove that if $f$ is continuous at $z = z_0$, then so are the functions $\overline{f(z)}$ and $\Re f(z)$. 
14. Find each of the following limits.
(a) \( \lim_{z \to 2\pi i} (\exp z - \exp(-z)) \)
(b) \( \lim_{z \to -\pi i} (z + 1) \exp \left( \frac{z^2 + \pi^2}{z + \pi i} \right) \)

15. Where are each of the following functions analytic?
(a) \( 8\pi + i \)
(b) \( \frac{z^3 + 2z^2 + i}{z - 5} \)
(c) \( x^2 + y^2 + y - 2 + ix \)
(d) \( |z|^2 + 2z \)

16. Use the Cauchy-Riemann equations to determine where the following functions are differentiable.
(a) \( f(x + iy) = (x^{4/3}y^{5/3} + ix^{5/3}y^{4/3})/(x^2 + y^2) \) for \( z \neq 0 \) and \( f(0) = 0 \).
(b) \( g(x + iy) = 3x^2 + 2x - 3y^2 - 1 + i(6xy + 2y) \).

17. Show that if \( f \) is analytic and real-valued on a connected open set, then \( f \) is a constant function.

18. Suppose \( f(z) \) and \( \overline{f(z)} \) are analytic on an open connected set. Show that \( f \) is a constant function.

19. Write each of the following numbers in the form \( a + bi \).
(a) \( \exp(2 + i\pi/4) \)
(b) \( \cos(1 - i) \)

20. Show that the formula \( \exp(iz) = \cos z + i\sin z \) holds for all complex \( z \).

21. Evaluate each of the following.
(a) \( \log i \)
(b) \( \log (\sqrt{3} + i) \)

22. Find all values of the following.
(a) \( 2^\pi i \)
(b) \( (1 + i)^3 \)

23. Find the principal value of the following.
(a) \( i^{2i} \)
(b) \( (1 + i)^{1-i} \)

24. Find all solutions of \( \sin z = 2 \).