1. Find all values     (a) of $(-1)^{1-i}$     (b) of $\sin(i - \pi)$

   in the form $a + ib$ where $a, b$ are real numbers.

2. Find all solutions of    $\sin z = -i$ in the form $a + ib$ where $a, b$ are real numbers.

3. Find all $z$ for which     $\log z = -\log \frac{1}{z}$     if

   (a) $\log w = Log\, w$     principal branch;
   (b) $\log w$ is the branch where $\arg w \in [0, 2\pi)$.

4. Find the Laurent series of    $f(z) = \dfrac{z}{z + 4}$ around $z_0 = i$

   in the domain containing the point 10.

   Find $b_2$ and the domain where is the series convergent.

5. Is $|\sin z| \leq 1$ for all complex $z$? Explain.State the theorem used.

6. Evaluate $I = \displaystyle\int_c \dfrac{1}{\sqrt{z}}\, dz$ where $c$ is the curve from $-i$ to $1 + i$ not crossing

   the principal branch cut of the square root function. $(I = a + ib, a, b\,\text{real})$

7. For $f(z) = \dfrac{1}{z} e^{\frac{z^2 + 2}{z}}$

   (a) classify all singularities; (b) find the residue at $z_0 = 0$.

8. Evaluate $\displaystyle\int_0^\infty \dfrac{\cos \frac{\pi}{4} x}{x^4 - 16}\, dx$ by means of Residue Theorem.Explain all your steps.

9. Evaluate $\displaystyle\int_0^{2\pi} \dfrac{\sin 3\theta}{5 - 3\sin \theta}\, d\theta$ by means of Residue Theorem.Explain all your steps.

10. For $w = z - \frac{1}{z}$ find

    (a) where the mapping is conformal;
    (b) the image of the circle $|z| = 2$;
    (c) the image of the $y$-axis minus the origin;
    (d) the image of the unit circle                in the $w$ plane.