

Problem 1. Give all possible values of the following in the form $x + iy$

- (1) $(1 - i)^i$
- (2) $\text{Log } e^{3 + \frac{5}{2}\pi i}$
- (3) $\cos(\frac{\pi}{2} + i)$

Problem 2. Find all values of z in \mathbb{C} where $f(z) = x^3 + iy^3$ is

- (1) (complex) differentiable
- (2) analytic

Problem 3. Find an entire function $f(z)$ whose imaginary part is $v(x, y) = y^3 - 3x^2y + 4xy - x$ and $f(1 + i) = 2 + i$.

Problem 4. (a) Find the domain of analyticity (i.e. all z where f is analytic) for

$$f(z) = \sqrt{(\text{Log } z) - \frac{\pi}{2}i}$$

where the square root is given by its principal branch. (b) Find $f(1)$.