

- (1) Solve the following quadratic equation  
 $z^2 + (1 + i)z + i = 0$ .
- (2) Let  $P(z)$  be a polynomial with real coefficients.  
Prove that if  $z_0$  is a root of  $P(z)$  then  $\bar{z}_0$  is also a root of  $P(z)$ .
- (3) Let  $P(z), Q(z)$  be two polynomials with complex coefficients such that  $P(n) = Q(n)$  for any natural  $n$ .  
Prove that  $P(z) = Q(z)$  for all  $z$ .
- (4) Express the following number as  $a + bi$  for some real  $a, b$ :

$$\frac{(3 - \sqrt{3}i)^{71}}{(1 - i)^{53}}$$

- (5) Find all complex solutions of the following equation

$$x^6 + 7x^3 - 8 = 0$$