

- ① If $z = 2+j$, find the followings (You may use MATLAB):
 (a) $w = z^*/2$; (b) $w = z^{57}$; (c) $w = \text{Re}\{z^7 - 12z^* + z^{17}\}$
- ② If $z = a+jb$, express the following functions in the form of $u(a,b) + jv(a,b)$ where u and v are real.
 (a) z^2 ; (b) $z/(2-z^*)$; (c) $e^{2z} + e^{z^*}$
- ③ Show that the followings:
 (a) $|z^n| = |z|^n$; (b) $(z_1 + z_2)^* = z_1^* + z_2^*$; (c) $|z_1 z_2| = |z_1| |z_2|$
- ④ Use the consequence of triangle inequality to show the followings:
 (a) $|z_1 + z_2| \geq ||z_1| - |z_2||$
 (b) $|z_1 - z_2| \leq |z_1| + |z_2|$
- ⑤ For the complex valued function $w(z) = \frac{1-z}{1+z}$
 (a) Determine the largest possible domain.
 (b) For the largest possible domain D , determine the range of $w(z)$.
 (c) Find the range of points for $\text{Re}\{z\} = 0$, $\text{Re}\{z\} > 0$; $\text{Re}\{z\} < 0$.
- ⑥ Determine the solution set of the following linear system of equations:

$$\begin{aligned} x_1 + x_2 + x_3 + x_4 &= 12 \\ x_1 + 2x_2 + 5x_4 &= 17 \\ 3x_1 + 2x_2 + 4x_3 - x_4 &= 31 \end{aligned}$$
- ⑦ Determine all values of constants a and b for which the following system

$$\begin{aligned} x_1 + x_2 - 2x_3 &= 4 \\ 3x_1 + 5x_2 - 4x_3 &= 16 \\ 2x_1 + 3x_2 - ax_3 &= b \end{aligned}$$

 has (a) no solution ; (b) a unique solution ; (c) an infinite number of solutions.