Exercise 1. Let $z_1 = -2 + 5i$, $z_2 = 3 - i$. Find, in the form $x + iy$:

a. $z_1 z_2$, $\overline{(z_1 z_2)}$

b. $\mathrm{Re}(z_1^2)$, $(\mathrm{Re} z_1)^2$

c. $\mathrm{Im}(1/z_2^2)$

d. z_1/z_2, $\overline{z_2}/\overline{z_1}$

e. $4(z_1 + z_2)/(z_1 - z_2)$

Exercise 2. Let $z = x + iy$. Find, in terms of x and y:

a. $\mathrm{Im}\frac{1}{z}$, $\mathrm{Im}\left(\frac{1}{z^2}\right)$

b. $\mathrm{Re}(z/\bar{z})$, $\mathrm{Im}(z/\bar{z})$

Exercise 3. Represent in polar form and graph in the complex plane:

a. 2, $3i$, $1 + i$, $-2 + 5i$

b. $\frac{\sqrt{2}+i/3}{-\sqrt{8}-2i/3}$

c. $1 + \frac{1}{2}\pi i$

Exercise 4. Determine the principal value of the argument:

a. $1 - i$

b. $\sqrt{3} + i$

c. $(1 - i)^{20}$

Exercise 5. Graph in the complex plane and represent in the form $x + iy$:

a. $4(\cos\frac{\pi}{2} - i\sin\frac{\pi}{2})$

b. $\sqrt{8}(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4})$

Exercise 6. Find and graph all the roots in the complex plane:

a. $\sqrt[3]{1-i}$

b. $\sqrt[3]{343}$

c. $\sqrt[4]{-4}$

d. $\sqrt[4]{i}$

e. $\sqrt[5]{-1}$

Exercise 7 (optional). Solve $z^2 - (6-2i)z + 17 - 6i = 0$.

Exercise 8 (optional). Parallelogram inequality:

$$|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2(|z_1|^2 + |z_2|^2).$$

Prove and explain the name.