

MAT 250 Homework 5

Spring 2026

Due date: Tuesday, Feb 17

In the first seven problems find the Cartesian form of the complex number indicated. Simplify as much as possible but do not use decimals.

1. $(-2 + 3i)^2$
2. $(-2 + 3i)^3$
3. $e^{i\pi/3}$
4. $\cos \frac{\pi}{3} e^{i\pi/4}$
5. $e^{i\pi/3} + e^{-i\pi/3}$
6. $e^{i3\pi/4}$
7. $e^{i3\pi/4} + e^{-i\pi/4}$

In the next seven problems, find a polar form $re^{i\theta}$:

8. $\frac{1}{2} + \frac{\sqrt{3}}{2}i$
9. $1 - \sqrt{3}i$
10. $2i(1 + i)$
11. $(1 + i)^8$
12. $(-1 + i)^8$
13. $1 + e^{i\frac{\pi}{2}} + (e^{i\frac{\pi}{2}})^2$
14. $\cos(-\frac{\pi}{3}) + \sin(\frac{\pi}{3})i$
15. Find the complex matrix product, and then compute its determinant. $\begin{pmatrix} 1-i & i \\ 2 & 1+i \end{pmatrix} \begin{pmatrix} 1+i & -i \\ 2 & 1-i \end{pmatrix}$
16. Let $z = 2 - i$ and $w = 1 + i$. Verify that $\bar{z} \cdot \bar{w} = \overline{zw}$, by computing each side. This means that the product of conjugates equals the conjugate of the product. Also verify that $|z||w| = |zw|$ by computing each side. This means that the length of a product equals the product of the lengths.