

Exercise 44

For the following exercises, use a calculator to help answer the questions.

Evaluate $(1 + i)^k$ for $k = 4, 8,$ and 12 . Predict the value if $k = 16$.

Solution

Evaluate the given expression for the desired values of k .

$$\begin{aligned}(1 + i)^4 &= 1^4 + 4(1)^3(i) + 6(1)^2(i)^2 + 4(1)(i)^3 + i^4 \\ &= 1 + 4i + 6(-1) + 4(-i) + 1 \\ &= 2 - 6 \\ &= -4\end{aligned}$$

$$\begin{aligned}(1 + i)^8 &= [(1 + i)^4]^2 \\ &= (-4)^2 \\ &= 16\end{aligned}$$

$$\begin{aligned}(1 + i)^{12} &= [(1 + i)^4]^3 \\ &= (-4)^3 \\ &= -64\end{aligned}$$

$$\begin{aligned}(1 + i)^{16} &= [(1 + i)^4]^4 \\ &= (-4)^4 \\ &= 256\end{aligned}$$