Exercise 45

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

Evaluate $(1 - i)^k$ for $k = 2$, 6, and 10. Predict the value if $k = 14$.

Solution

Evaluate the given expression for the desired values of k.

$$(1 - i)^2 = 1 - 2i + i^2$$
$$= 1 - 2i + (-1)$$
$$= -2i$$

$$(1 - i)^6 = [(1 - i)^2]^3$$
$$= (-2i)^3$$
$$= -8i^3$$
$$= -8(-i)$$
$$= 8i$$

$$(1 - i)^{10} = [(1 - i)^2]^5$$
$$= (-2i)^5$$
$$= -32i^5$$
$$= -32i^4 \cdot i$$
$$= -32(1) \cdot i$$
$$= -32i$$

$$(1 - i)^{14} = [(1 - i)^2]^7$$
$$= (-2i)^7$$
$$= -128i^7$$
$$= -128i^4 \cdot i^2 \cdot i$$
$$= -128(1) \cdot (-1) \cdot i$$
$$= 128i$$