

R.2 Complex Numbers

$$i = \sqrt{-1}.$$

$i^0 = 1$ Anything to the power of 0 is always 1.

$i^1 = i$ Anything to the power of 1 is itself.

$i^2 = -1$ This is true because $i^2 = i \cdot i = \sqrt{-1} \cdot \sqrt{-1} = (\sqrt{-1})^2 = -1$

$i^3 = -i$ This is true because $i^3 = i^2 \cdot i = -1 \cdot i = -i$

$i^4 = 1$ This is true because $i^4 = i^3 \cdot i = -i \cdot i = -\sqrt{-1} \cdot \sqrt{-1} = -(-1) = 1$

EXAMPLE: Simplify: i^{38} .

EXAMPLE: Simplify: i^{359} .

Standard Form of an Imaginary (Complex) Number

$$a + bi$$

EXAMPLE: Add and simplify: $(9 + 12i) + (5 - 2i)$. Write your answer in standard form.

EXAMPLE: Subtract and simplify: $(8 - 5i) - (-2 + 6i)$ and write your answer in standard form.

EXAMPLE: Multiply and simplify: $(2 + 5i)(3 - 4i)$. Write your answer in standard form.

EXAMPLE: If $z = 1 - 2i$ and $w = 3 - 4i$, find $z \cdot \bar{w}$ and write your answer in standard form.

EXAMPLE: Simplify and write your answer in standard form: $\sqrt{4} - \sqrt{-16}$.

EXAMPLE: Divide and simplify: $\frac{4-2i}{3+i}$. Write your answer in standard form.

EXAMPLE: Divide and simplify: $\frac{\sqrt{4} + \sqrt{-49}}{\sqrt{25} - \sqrt{-9}}$. Write your answer in standard form.

EXAMPLE: Simplify and write your answer in standard form: $\sqrt{-12}(\sqrt{-4} - \sqrt{2})$.

EXAMPLE: Solve the equation using the quadratic formula and write in standard form: $0 = 3x^2 - 4x + 6$.