

Imaginary numbers were created to take the square root of a negative number.

The imaginary unit, i , is defined as...

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

square both sides $\Rightarrow i^2 = (\sqrt{-1})^2 = -1$

multiply both sides by $i \Rightarrow i^3 = -1 \cdot i = -i$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$$

Evaluate the following powers of i

Powers of i

Method 1: Rewrite as a power of 2

$$i = i$$

$$i^{14}$$

$$i^2 = -1$$

$$i^{24}$$

$$i^3 = -i$$

$$i^{21}$$

$$i^4 = 1$$

$$i^{35}$$

Evaluate the following powers of i

Powers of i

Method 2: Divide power by 4; determine remainder.

$$i = i$$

$$i^{22}$$

$$i^2 = -1$$

$$i^{45}$$

$$i^3 = -i$$

$$i^{32}$$

$$i^4 = 1$$

$$i^{27}$$

Evaluate the following powers of i

Powers of i

Method 2: Divide power by 4; determine remainder.

$$i = i$$

$$5 \cdot i^{31}$$

$$i^2 = -1$$

$$-2 \cdot i^{16}$$

$$i^3 = -i$$

$$7 \cdot i^{37}$$

$$i^4 = 1$$

$$-i^{10}$$

Powers of i

$$i = i$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

Method 1:

Rewrite as a power of 2

Method 2:

Divide power by 4; determine remainder.