## Imaginary Numbers - Complex Numbers

Solve: $\quad x^{2}+1=0$

$$
x^{2}=-1 \quad \text { No real solution }
$$

Introducing square roots of negative numbers - imaginary numbers

$$
\begin{aligned}
i^{2}+1 & =0 \\
i^{2} & =-1 \\
i & =\sqrt{-1} \\
\forall \mathrm{x} \in \mathrm{R}, \mathrm{x}>0, & \sqrt{-x}=\sqrt{x} i
\end{aligned}
$$

Examples: $\sqrt{-4}=2 i \quad \therefore(2 i)^{2}=-4$
$\sqrt{-25}=5 i \quad \therefore(5 i)^{2}=-5$

$$
\sqrt{-18}=3 \sqrt{2} I \quad \therefore(3 \sqrt{2} i)^{2}=-18
$$

$$
\begin{aligned}
i & =\sqrt{-1} \\
i^{2} & =-1 \\
i^{3} & =-\mathrm{i} \\
i^{4} & =1
\end{aligned}
$$

When you simplify successive powers of $I$, the values repeat in cycles of 4

