Aim: What is the complex number?

- **Do Now: Solve for *x*:**
- **1. $x^2 - 1 = 0$**
- **2. $x^2 + 1 = 0$**
- **3. $(x + 1)^2 = -4$**

Homework: p.208 # 6,8,12,14,16,44,46,50

$x^2 - 1 = 0$, $x^2 = 1$, $x = \pm 1$, the roots are real numbers

$x^2 + 1 = 0$, $x^2 = -1$,

What's wrong with the answer?

In real number system, $x^2 = -1$ is not legitimate, therefore we need to have a different number system to take care this situation.

Complex Numbers

The Imaginary Unit *i*

- Until now, you have always been told that you can't take the square root of a negative number. If you use imaginary units, you can!
- The imaginary unit is ***i***.
- ***i*** = $\sqrt{-1}$
- It is used to write the square root of a negative number.

$x^2 + 1 = 0$, $x^2 = -1$, $x = \pm\sqrt{-1}$ $\qquad x = \pm i$

$$(x+1)^2 = -4$$

$$x+1 = \pm\sqrt{-4}$$ Take square root on both sides

$$x+1 = \pm i\sqrt{4}$$ Change negative number in the square root to positive in terms of *i*

$$x+1 = \pm 2i$$ Simplify the radical

$$x = -1 \pm 2i$$ Move 1 to the right side of equation

– 1+ 2*i* or –1 – 2*i* are called complex numbers

Complex Numbers

- A complex number has a real part & an imaginary part.
- Standard form is:

$$a + bi$$

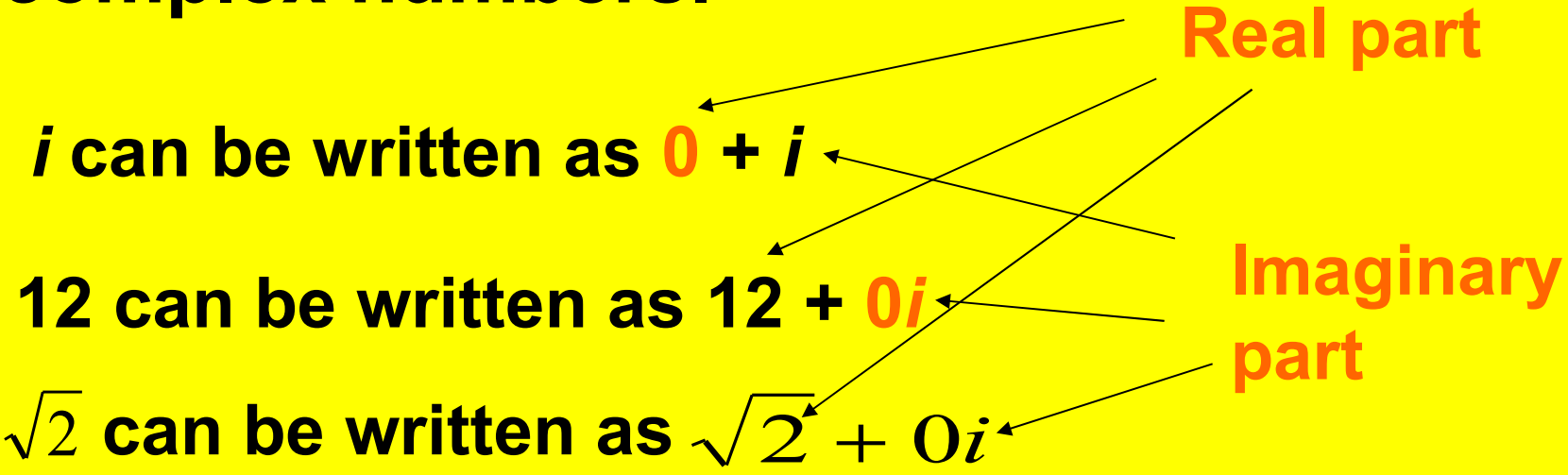
Real part

Imaginary part

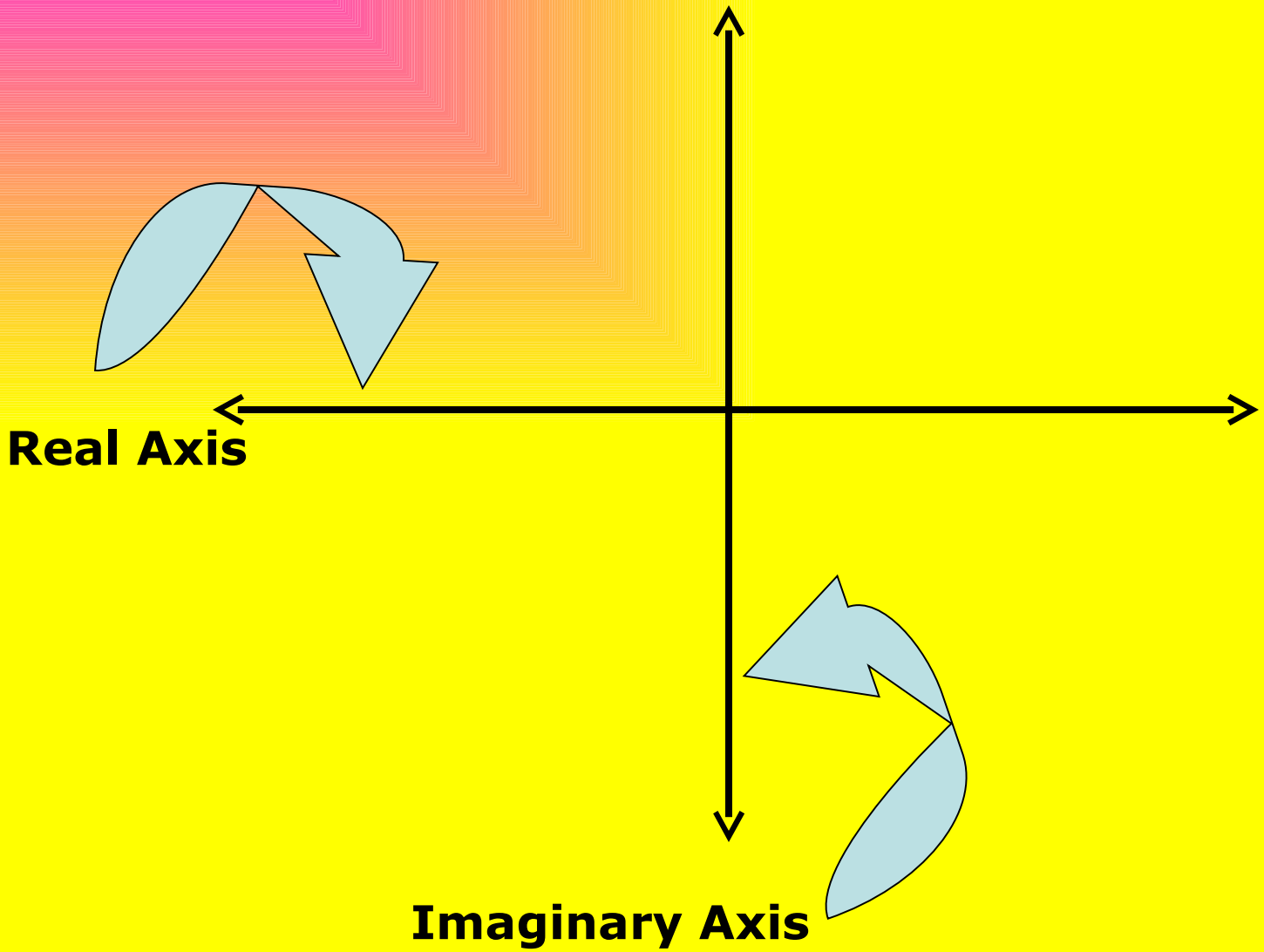
The complex number is the largest category in the number system. All the numbers can be written in the form of complex number

For example:

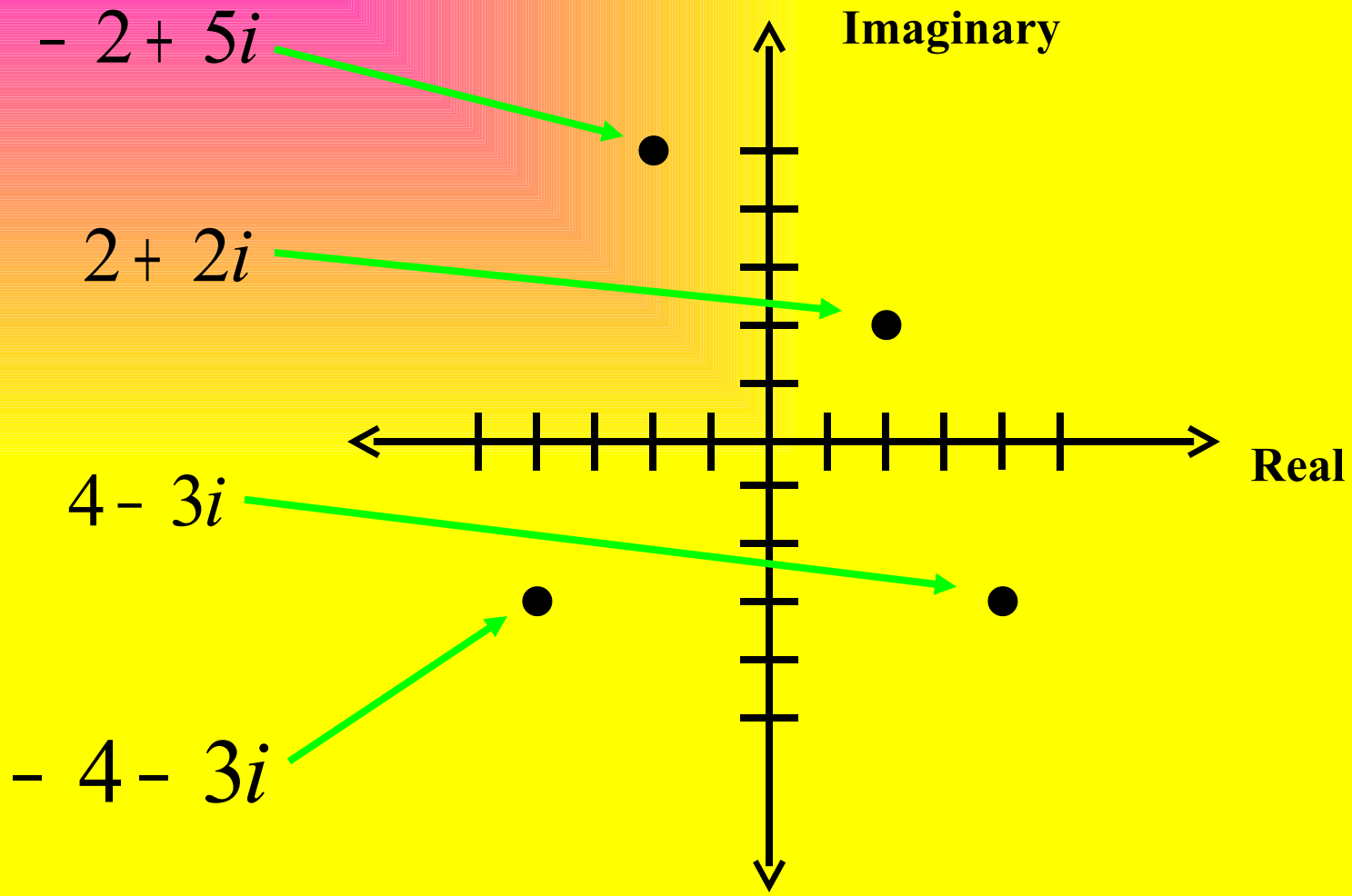
2+*i*, 3-2*i*, 6+5*i*, 1+*i*$\sqrt{3}$, *i*, $\sqrt{2}$ and 12 are all complex numbers.



The Complex plane



Graphing in the complex plane



Write each number in terms of *i*

$\sqrt{-9}$

$\sqrt{-7}$

$-\sqrt{-121}$

$\sqrt{-12}$

$\sqrt{-72}$