**KEY FACTS AND CONCEPTS**

**Complex numbers**

* **Cartesian form:**

where and are both real.

The complex number can also be represented in the vector form .

The **complex conjugate** of   
 is .

On an Argand diagram, is the reflection of in the real axis.

We can also write the complex conjugate of as .

* **Modulus and argument:**

If where a and b are real, then .

* **Argument:**
* **Properties of modulus:**
  + .
  + .
  + and for .
  + for .
  + and .
* **Properties of arg:**
  + .
  + .
  + .
* If and then is the distance between and .
* **Polar form:**

If makes an angle of with the -axis then .

* + .
  + and .
* **Properties of cis:**
  + .
  + .
  + .
  + for all integers .
* **De Moivre’s theorem:**
  + for all rational .
* If then
  + and .
* **th roots:**
  + The th roots of the complex number are the solutions of the equation .
* **th roots of unity:**
  + The th roots of unity are the solutions of the equation , and these are where .