Complex Roots of Quadratic Equations

Spoken Tutorial Project
http://spoken-tutorial.org
National Mission on Education through ICT
http://sakshat.ac.in

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10 June 2018

We will learn to,

Learning Objectives

We will learn to,

- **Plot graphs of quadratic functions**

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- **Plot graphs of quadratic functions**
- **Calculate real and complex roots of quadratic functions**

Pre-requisites

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- **GeoGebra interface**

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- **If not, for relevant tutorials, please visit our website**
  www.spoken-tutorial.org

System Requirement

- **Ubuntu Linux OS v 14.04**

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- **GeoGebra 5.0.388.0-d**

Quadratic Polynomials

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2nd degree polynomial $y = ax^2 + bx + c$

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2nd degree polynomial $y = ax^2 + bx + c$

- **Parabola**
- **If parabola intersects x axis, x intercepts are real roots**
- **If parabola does not intersect x axis at all, no real roots, only complex**

- **A complex number, $z = a + bi$ where $a =$ real part, $bi =$ imaginary part, and a and b are constants**

Complex Numbers, XY Plane

- **A complex number, $z = a + bi$ where $a = $ real part, $bi = $ imaginary part, and a and b are constants**

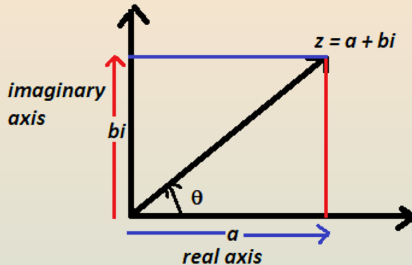- **Imaginary number, $i = \sqrt{-1}$**

Complex Numbers, XY Plane

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- **In the XY plane, $a + bi$ is point (a, b)**

Complex Numbers, XY Plane

- **A complex number, $z = a + bi$ where $a =$ real part, $bi =$ imaginary part, and a and b are constants**

- **Imaginary number, $i = \sqrt{-1}$**

- **In the XY plane, $a + bi$ is point (a, b)**

- **In the complex plane, x axis = real axis, y axis = imaginary axis**
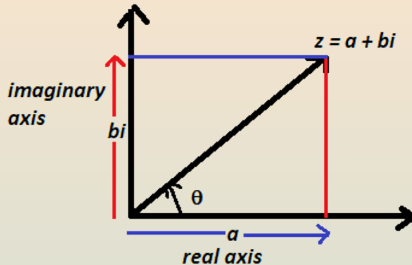
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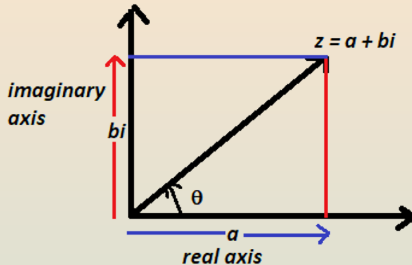- **Length of vector $z = |z| = r$**

Complex Numbers, Complex Plane

- **In complex plane, z is a vector with real axis co-ordinate a and imaginary axis co-ordinate b**

- **Length of vector $z = |z| = r$**

- $r = \sqrt{a^2 + b^2}$ **(Pythagoras' theorem)**

Summary

In this tutorial, we have learnt to,

- **Visualize quadratic polynomials, their roots and extrema**
- **Use a spreadsheet to calculate roots (real and complex) for quadratic polynomials**

- **Drag sliders to graph different polynomials**

Assignment

- **Drag sliders to graph different polynomials**
- **Calculate roots of the polynomials**

About the Spoken Tutorial Project

- Watch the video available at
  http://spoken-tutorial.org
  /What_is_a_Spoken_Tutorial

- It summarizes the Spoken Tutorial
  project

- If you do not have good bandwidth,
  you can download
  and watch it

Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- **Conducts workshops using spoken tutorials**

- **Gives certificates to those who pass an online test**

- **For more details, please write to contact@spoken-tutorial.org**

Forum for specific questions

- **Do you have questions in THIS Spoken Tutorial?**

- **Please visit http://forums.spoken-tutorial.org**

- **Choose the minute and second where you have the question**

- **Explain your question briefly**

- **Someone from our team will answer**

Acknowledgements

- **Spoken Tutorial Project is a part of the Talk to a Teacher project**

- **It is supported by the National Mission on Education through ICT, MHRD, Government of India**

- **More information on this Mission is available at**
  http://spoken-tutorial.org /NMEICT-Intro