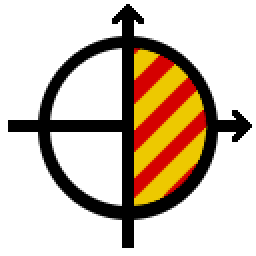
|  |
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| Argand Plotter |
| User Manual: A-Level Edition |

Sam Hubbard



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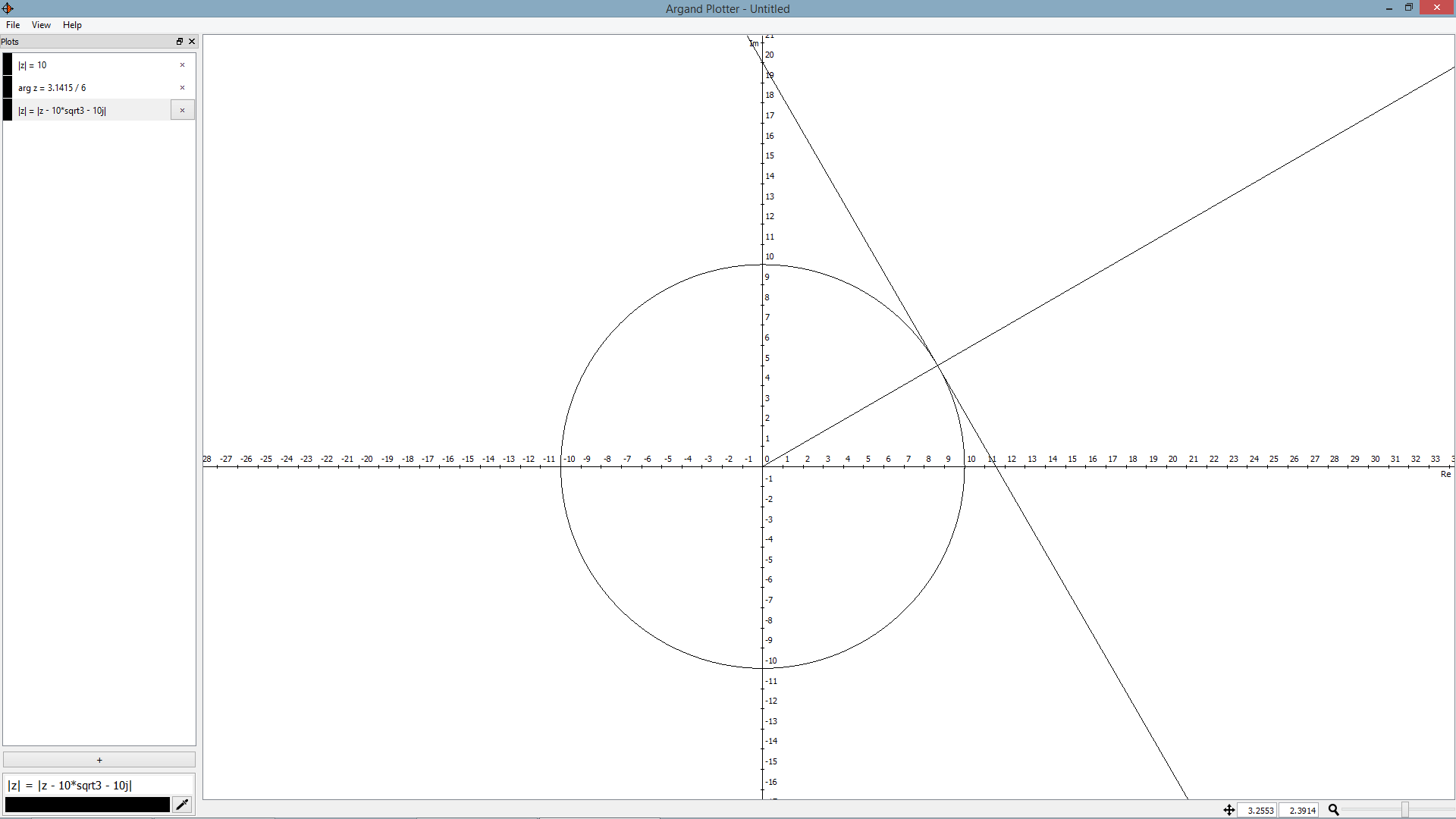
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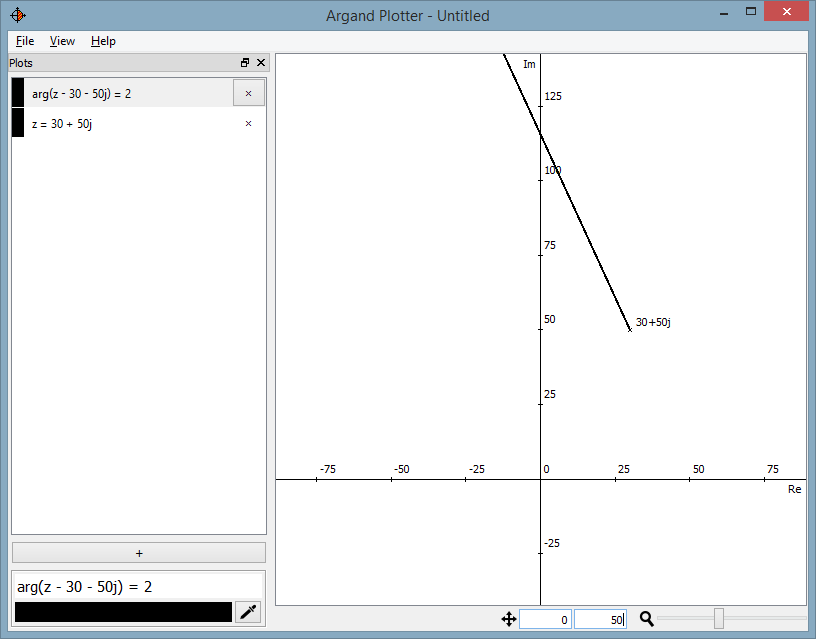
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## Introduction



*Thank you for using Argand Plotter!*



Argand Plotter is a graphing package specifically designed to plot **Argand diagrams.** While many software packages exist for plotting **Cartesian equations**, very few solutions exist for drawing **loci** involving complex numbers, and those that do are limited. Argand Plotter – originally created as an A-Level Computing coursework project for a student’s maths department – aims to fill this niche.

Argand Plotter is designed for teachers and students, to aid learning of the UK GCE Further Maths syllabus; however, anyone learning about complex numbers and Argand diagrams can find use in it.

This guide explains how to install and use the program, as well as how to avoid some known bugs and caveats.

*Note:* Important notes are shaded in grey.

*Warning:* Warnings are shaded in red.

## System Requirements

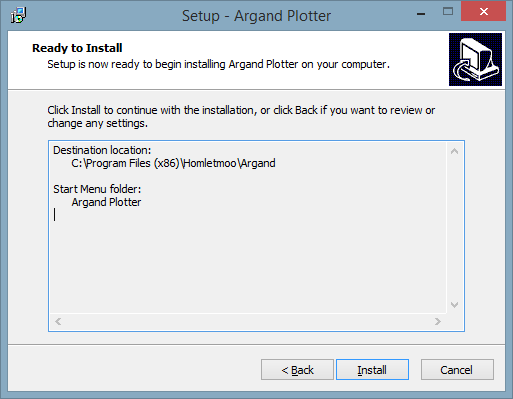
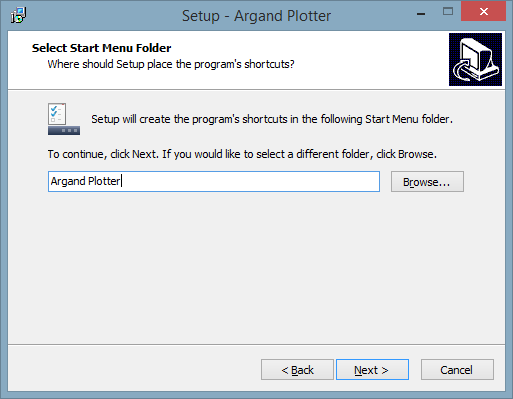
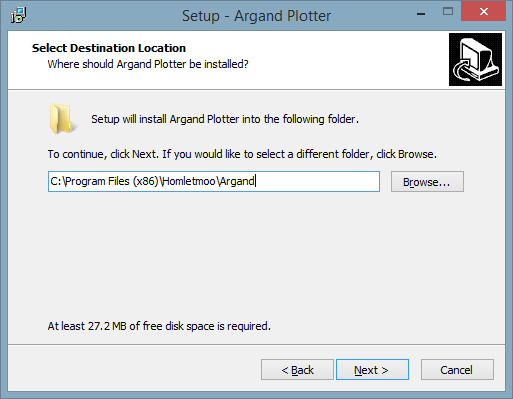
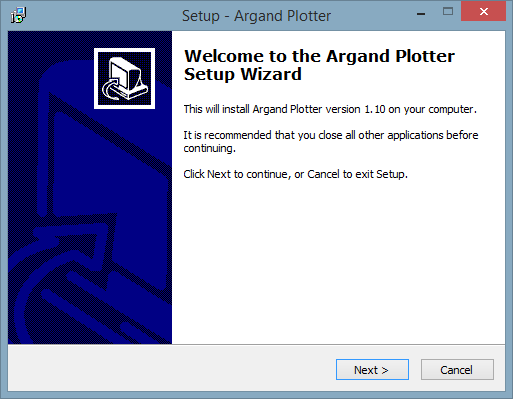
|  |  |
| --- | --- |
| Operating system: | * Windows 7 * Windows 8 / 8.1 * Mac OS X * Ubuntu 14.04.2 LTS   *Note:* This list is not exhaustive, and the program may work on other OSs. |
| Display resolution: | 1024 x 768 or greater recommended. |
| **Python** (**source** only): | Python 3 or later (3.4 recommended). |
| **PyQt** (source only): | PyQt 4 or later (4.11.2 recommended). |

## Installation Instructions

### Windows

There are three options for installation on Windows:

1. *Installer:*The installer is by far the easiest option. It creates start menu entries and **file associations** for the program, and includes an uninstaller. To install the program, simply run the installer and follow the on-screen instructions.



1. *Zip:*A zip containing precompiled Windows **binaries** is also supplied. Since the program doesn’t create any configuration files on the computer, the zip may be unpacked on a memory stick to create a **portable install**.
2. *Source (advanced):*As Python is an interpreted language, it may be run directly from source. This option is best for those interested in how the program works, or who want to modify it. Python 3 and PyQt 4 are required. The entry point is *main.pyw*.

### Mac OS and Linux

Unfortunately, the only current option for installation on these operating systems is source. Therefore, Python 3 and PyQt 4 are required.

## User Interface

Drawing area

List of plots

Plot

Equation input

Add new plot

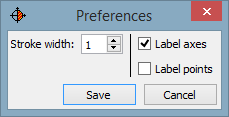
Change plot colour

Set the view centre

Set the zoom level

Name of current document

### Window Layout



Set the stroke width used for lines in the drawing area

Set whether plotted points should be labelled with their values

Set whether the axes in the drawing area should be labelled

### Menubar

Create and open a blank Argand diagram.

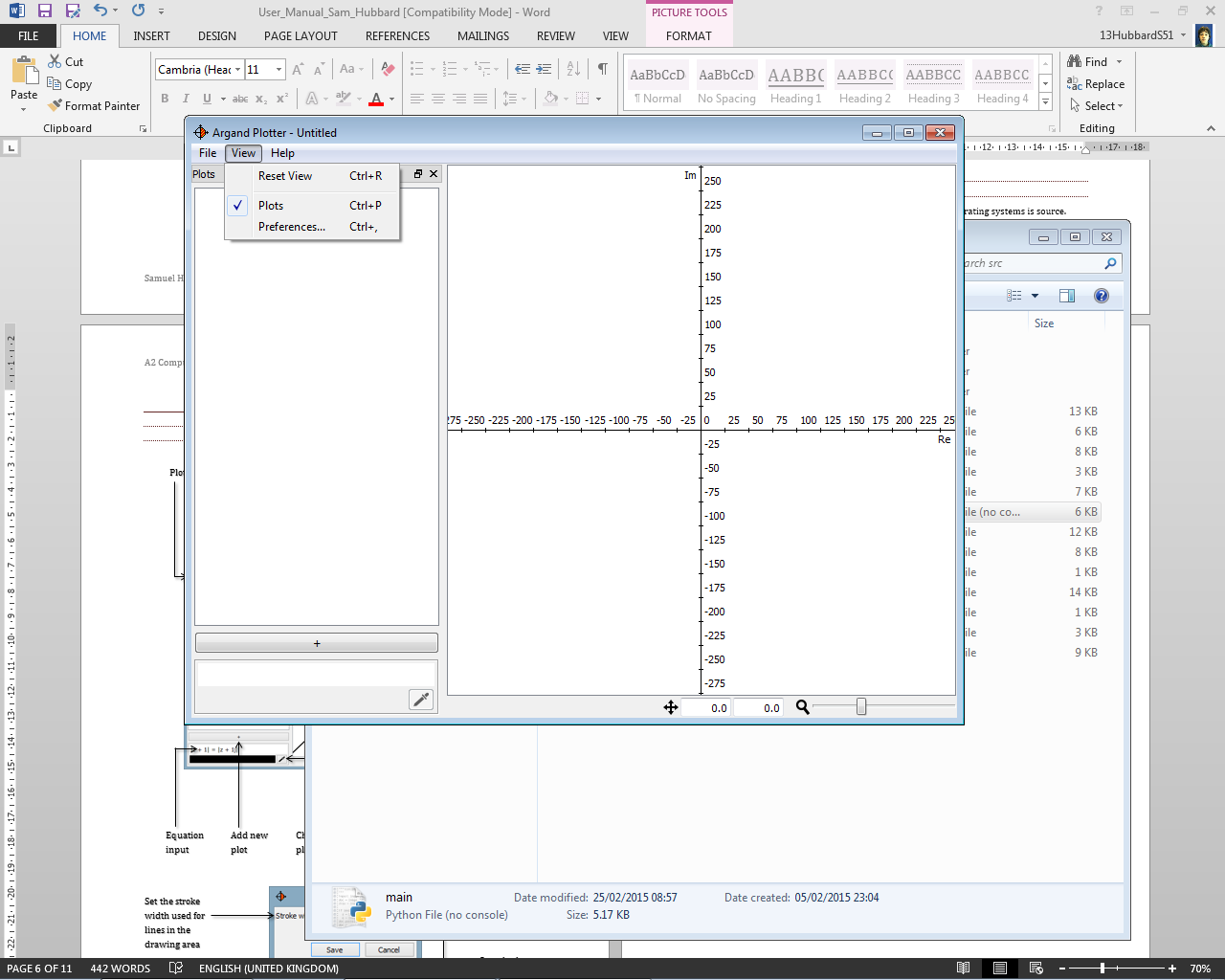
Open an existing Argand diagram from a .arg file.

Save the current diagram to an .arg file.

Save the current diagram with a new name.

Exit the program.

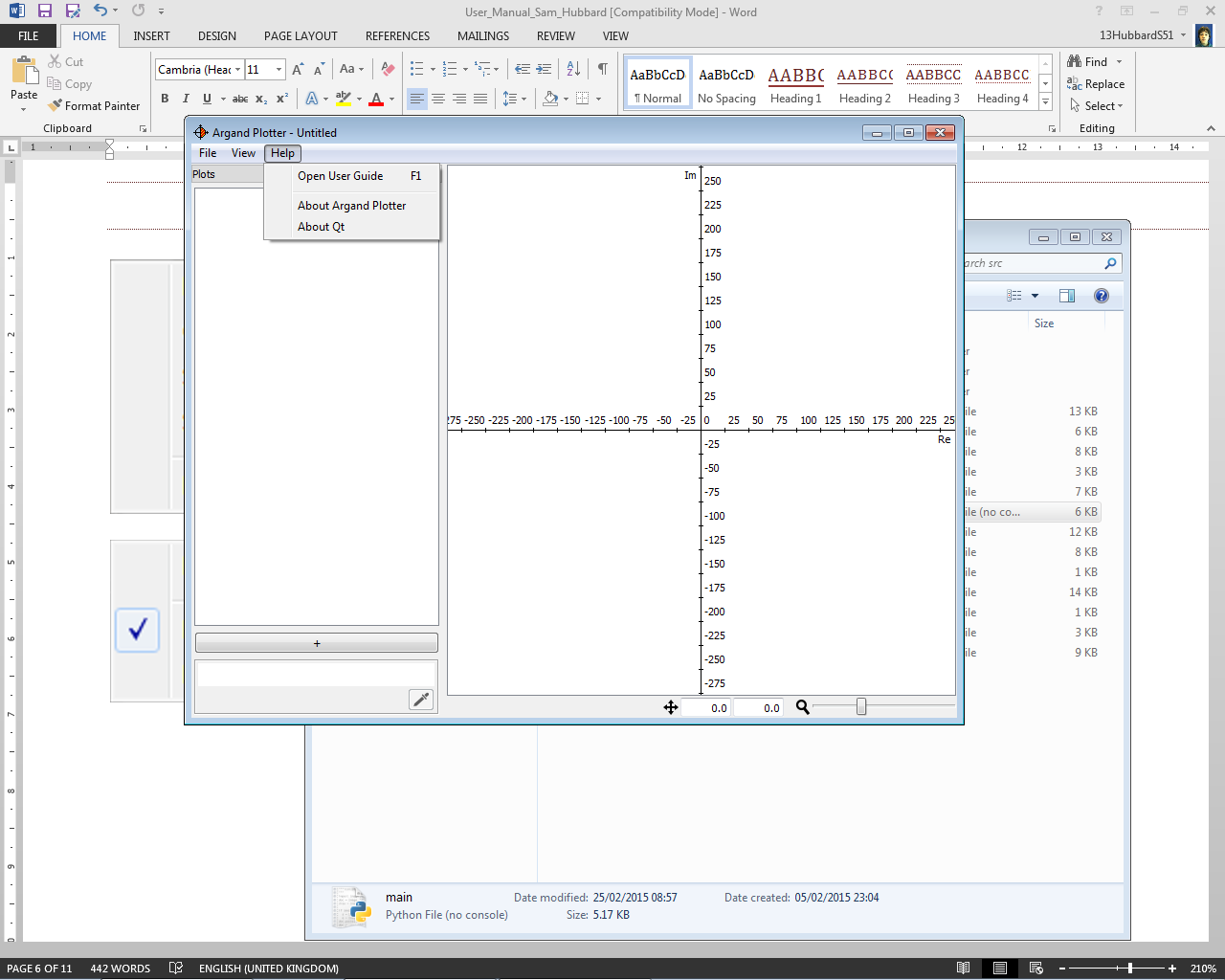
Help View File



Reset the view

Toggle the plot list dialog.

Show the preferences dialog.



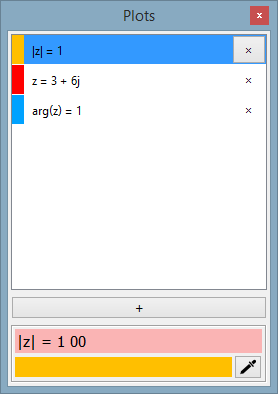
Open this guide.

Display information about the program.

Display information about the Qt framework.

### Plot Input

*Note:* The plot dialog can be docked into the main window, or used as a separate window.



The last valid equation entered

Delete the selected plot

Add new plot

Equation input area

Selected colour

Set plot colour and opacity

## Entering Equations

Equations are entered as **plaintext**, and are automatically evaluated as you type. When an equation is recognised, it is loaded into the selected plot, and drawn in the drawing area. The equation input area indicates when an equation is unrecognised by turning red.

*Note:* The **parser** uses the character j as the **imaginary unit**, rather than i as is commonly used in mathematical notation.

The parser is fairly good at recognising different forms of equation, but there are still some quirks that should be noted, and standard forms of input that should be adhered to if possible.

The following forms of equation are accepted as valid loci:

p\*z + a + cj = q\*z + b + dj The point ((a-b)/(q-p), (c-d)/(q-p)).

|z – b - cj| = a A circle, radius a, centred on (b, c).

|z – b – cj| < or <= a A **disk**, radius a, centred on (b, c).

|z – b – cj| > or >= a A **negative disk**, radius a, centred on (b, c).

|z – a – bj| = |z – c – dj| **Perpendicular bisector** of (a, b) and (c, d).

|z – a – bj| >, <, >= or <= |z – c – dj| A **half plane**.

arg(z – b – cj) = a **Ray** with angle a, from (b, c).

arg(z – a – bj) = arg(z – c – dj) Rays away from (a, b) and (c, d).

Any place a real number is expected, an expression that returns a real number can be placed. The variable may be replaced with any lowercase letter other than j.

*Warning:* The parser attempts to parse the equation every time a new character is entered. Certain equations can take a long time to parse, so to avoid very slow response times when inputting your equation, avoid using more than two nested parentheses or mod lines. This is an unintended issue that may be fixed in the future.

## Saving and Loading .arg Files

Diagrams may be saved to files with a .arg **extension**. These files store all the plots with their respective colours, along with the current zoom level and view centre.

*Warning:* The current stroke width, and labelling preferences are not stored in .arg files.

Options for saving and loading .arg files can be found in the ‘File’ menu.

If the program has been installed on Windows using the installer, it is possible to open .arg files with Argand Plotter simply by double clicking them in **Windows Explorer**.

*Note:* A number of example .arg files are included in the installation, under the ‘examples’ directory.

## Glossary

**Argand diagram** A diagram with a real and imaginary axis, for showing complex numbers.

**Binary (executable file)** A file which can be run as a piece of software.

**Cartesian equation** An equation which can be written f(x, y) = 0.

**Disk**  The locus of points inside a circle.

**File association** Tells the operating system to open certain files with a specific program.

**Half plane** The locus of points on a plane to one side of a line.

**Imaginary unit** The principle square root of -1.

**Locus (pl. loci)** A set of points which all satisfy a given condition.

**Negative disk** The locus of points outside a circle.

**Parser** The piece of software that translates text equations into drawings.

**Perpendicular bisector** The line perpendicular to another, which crosses the midpoint.

**Plaintext** Text without any fancy formatting or symbols.

**Portable install** An installation on an external device which may be run on any computer.

**Python** The programming language Argand Plotter is written in.

**PyQT** A port of the Qt library for Python.

**Ray** An infinitely long line projected from a point.

**Source (code)** The code that was written to create a program.

**Windows Explorer** The built-in file-system browser in Windows.