

AME 20214

Homework 9

Due: Thursday, 14 November 2013, in class

1. Write a program to generate a well-resolved elegantly prepared plot of all of the real roots of

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

for  $a \in [-2, 2]$ . Give your plot with  $a$  on the abscissa and  $x$  on the ordinate. Take care that your plot reflects the mathematics correctly near  $a = 0$  and filters any obviously numerical artifacts.

You can either write a single program to calculate the roots and run the program many times or, if you are ambitious, can read ahead and write a subroutine to calculate the roots and have the main program calculate the roots for various  $a$  in one run of the program. Use only **real** or **integer** variables, and make effective use of control statements such as **if**.

2. Repeat the previous exercise using **complex** variables as appropriate. Use your program to generate a well-resolved elegantly prepared plot of all of the real roots of

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

for  $a \in [-2, 2]$ . Give your plot with  $a$  on the abscissa and  $x$  on the ordinate.

Prepare your homework with the L<sup>A</sup>T<sub>E</sub>X text processor. Include at least one equation. Write with concision and precision (but not derision!). Three page maximum. Include **verbatim** listings of your codes. Grading: technical merit, 50 points; aesthetics, 50 points.