hw4.sagews

April 21, 2014

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1 Homework 4 - Math 480b - Spring 2014

Due Friday, April 25, 2014 by 6pm

This homework will be automatically collected from the folder homework4 in your project, sometime after 6pm on Friday, April 25.

For help email Simon Spicer (mlungu@uw.edu) and/or William Stein (wstein@uw.edu) and/or the mailing list sagemath2014@googlegroups.com.

1.1 Problem 1 vectors in 3 space

Create a Python class that models vectors in 3 dimensional space with rational number entries. You may use code in Sage such as QQ, but please dont use the vector class in Sage, which already does all this (though of course you can look at that code if you want).

class Vec3: def __init__(self, ...?): ...

def __add__(self, right): ...

def __sub__(self, right): ...

def __repr__(self): ...

def cross_product(self, right): ...

def dot_product(self, right): ...

def length(self): ...

def plot(self): ...

You should be able to add and subtract these vectors, multiply them by scalars, compute the dot and cross products, compute their length, and draw a (3 dimensional) plot. Write docstrings with examples for each function in your class. You may put this code in a separate file vec3.sage to make writing (and testing) it easier. You can test the examples in your docstrings by typing sage -t vec3.sage in the terminal. The docstrings should have the following format (dont bother to document the inputs explicitly):

""" Short description.

Longer description for more complicated functions.

EXAMPLES::

sage: 2+2 4 """

1.2 Problem 2 Gaussian rational numbers

Basically the same as problem 1, except model the field of Gaussian rational numbers

$$K = \{a + bi : a, b \in \mathbf{Q}\}.$$

This is the collection of complex numbers of the form a rational number plus i times a rational number. If you add, multiply, or divide any two such numbers, the result is again of the form $a + bi$.

NOTE: Instead of cross product and dot product methods youll implement multiplication and division.

I recommend putting your code in a file gauss.sage.

You may use code in Sage such as QQ, but please dont directly use the number fields code in Sage (e.g., QQ[i]), which already does all this (though of course you can look at that code if you want).

1.3 Problem 3 Your Project

Based on feedback and possibly consultation with instructors, decide on a project topic. Put two hours of work into your project and record what happened here. (Youll be graded on whether what you do is genuine.) Note that a first rough draft of your project will be due on May 9.