

hw1.sagews

March 31, 2014

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1 Homework 1 - Math 480b - Spring 2014

Due Friday, April 4, 2014 by 6pm

Turn it in by creating a folder called homework1 in your project, with this worksheet and also the latex document you create below.

You can put this worksheet in a SageMathCloud project by navigating to a directory (using the Files tab), then click +New and paste the following in the blank then click From Web”:

<https://raw.githubusercontent.com/williamstein/sage2014/master/homework/homework1/hw1.sagews>

Make sure to email sagemath480@gmail.com by Wednesday, April 2, with your project_id, so I know where to find your homework!

1.1 Problem 1

Create a complete standalone LaTeX document (a .tex file) that should use \title, \author, \section, \subsection, \tableofcontents, a typeset math equation, and the \label and \ref commands.

1.2 Problem 2

This is a programming problem that is nice and easy to get us started with programming in Python.

- write a Pyt function that takes as input 3 arguments, and returns their sum, product, and average. It should have a docstring.
- write a function fibonacci_list that takes an integer n as input, and returns a list containing the first n Fibonacci numbers.

1.3 Problem 3

- Write a function called `cashier` that makes change for you. That is, you should take as input a number between 1 and 100, and return a number of quarters, dimes, nickels, and pennies whose total value is equal to that number. You're welcome to decide on your own output format however, you must describe the output format in the docstring for the function. (The number of quarters, dimes, etc., need not be optimal.)

1.4 Problem 4

- We're going to see just how important indentation is in Python. Create two functions `f` and `g`, let's say both of which take a single integer argument `n`, that have the following properties:
 - `f` and `g` are both valid Python functions,
 - `f` and `g` are identical, except for the indentation of some number of lines in their body, and for some input value `a`, we have `f(a) != g(a)`.

1.5 Problem 5

Solve all of the following problems using Sage. Show the code you use to get the answer.

- Compute the number of digits of 17^{2014}
- make up a random 5x5 matrix and compute its rank and determinant
- make up a symbolic function of your choosing (like $x \sin(x^2)/3$, say) and compute its derivative and an integral
- compute the Taylor expansion to 5 terms of the symbolic function you made up above.
- make up a 20 digit random integer by banging on your keyboard, and find the prime factorization of that integer.
- find all complex roots of the polynomial $x^9 + x + 1$.