

due-02-26.sagews

February 21, 2014

Contents

1 Homework 6 Due Feb 26, 2014	1
1.1 Instructions	1
1.2 Problems (mainly about continued fractions)	1
1.2.1 Problem 1:	1
1.2.2 Problem 2:	1
1.2.3 Problem 3: Preparation for quadratic irrationals	1
1.2.4 Problem 4: Preparation for sums of squares	2
1.2.5 Problem 5: Improve your project	2

1 Homework 6 Due Feb 26, 2014

1.1 Instructions

- Put your solutions in the empty space below the problem.
- When youre done, open the worksheet, and copy/paste the URL to this worksheet into an email to wstein@gmail.com with the subject math 480: homework 02-26.

1.2 Problems (mainly about continued fractions)

1.2.1 Problem 1:

If $c_n = p_n/q_n$ is the n th convergent of $[a_0, a_1, \dots, a_n]$ and $a_0 > 0$, show that

$$[a_n, a_{n-1}, \dots, a_1, a_0] = \frac{p_n}{p_{n-1}}$$

and

$$[a_n, a_{n-1}, \dots, a_2, a_1] = \frac{q_n}{q_{n-1}}.$$

(Hint: In the first case, notice that $\frac{p_n}{p_{n-1}} = a_n + \frac{p_{n-2}}{p_{n-1}} = a_n + \frac{1}{\frac{p_{n-1}}{p_{n-2}}}$.)

1.2.2 Problem 2:

Show that every nonzero rational number can be represented in exactly two ways by a finite simple continued fraction. (For example, 2 can be represented by $[1, 1]$ and $[2]$, and $1/3$ by $[0, 3]$ and $[0, 2, 1]$.)

1.2.3 Problem 3: Preparation for quadratic irrationals

Evaluate the infinite continued fraction $[2, \overline{1, 2, 1}]$.

1.2.4 Problem 4: Preparation for sums of squares

Find a positive integer that has at least three different representations as the sum of two squares, disregarding signs and the order of the summands.

Just to clarify what I'm asking, e.g., the number 65 can be written as a sum of two squares in TWO genuinely different ways, namely $7^2 + 4^2 = 8^2 + 1^2 = 65$.

```
B = int(sqrt(65))
for a in [0..B]:
    for b in [0..a]:
        if a^2 + b^2 == 65:
            print a, b
```

```
7 4
8 1
```

1.2.5 Problem 5: Improve your project

- Add at least one figure to your project there is an example of how to do that here: <https://cloud.sagemath.com/projects/d6df9d1b-2462-4aa2-91e0-995610ea1726/files/project-help/image-in-tex/>
- Get another paragraph of feedback about your project from somebody else in our class (different than last time) and put it below.