

SageMathCloud Demo

William Stein

SageMath, Inc.



October 2016

Email address

Password

Sign In

[Forgot Password?](#)



Connect with



Create an Account

First and last Name

Email address

Choose a password

By clicking Sign up! you agree to our [Terms of Service](#).

Sign up!

Email help@sagemath.com if you need help.



Tools for Teaching

Create projects for your students, hand out assignments, then collect and grade them with ease.



Collaboration Made Easy

Edit documents with multiple team members in real time.



All-in-one Programming

Write, compile and run code in nearly any programming language.



Computational Mathematics

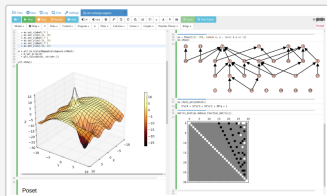
Use SageMath, IPython, the entire scientific Python stack, R, Julia, GAP, Octave and much more.



LaTeX Editor

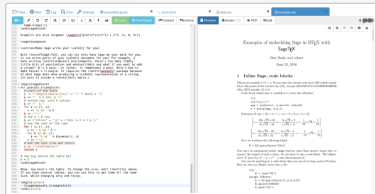
Write beautiful documents using LaTeX.

Interactive Worksheets



Interactively explore mathematics, science and statistics. **Collaborate with others in real time.** You can see their cursors moving around while they type — this works for Sage Worksheets and even Jupyter Notebooks!

LaTeX Editor



SageMathCloud supports authoring documents written in LaTeX, Markdown or HTML. The **preview** helps you understanding what's going on. The LaTeX editor also supports **forward and inverse search** to avoid getting lost in large documents. SageMathCloud also allows you to publish documents online.

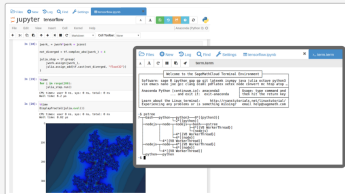
Course Management

A screenshot of the SageMathCloud Course Management interface. It shows a table of course assignments for a user named "KURS NIELS". The table has columns for "Student", "Assignment", "Status", and "Due Date". The assignments are listed in rows, with columns for "Assign to Student", "Collect from Student", "Assign Peer Grading", "Collect Peer Grading", "Grade", and "Release Student". The status of each assignment is shown in a colored box (e.g., "Not Open", "Open", "Closed").

Student	Assign to Student	Collect from Student	Assign Peer Grading	Collect Peer Grading	Grade	Release Student
steve@math.ucdavis.edu	Not Open	Not Open	Not Open	Not Open	Grade 1	Not Open
steve@math.ucdavis.edu	Open	Open	Open	Open	Grade 2	Not Open
steve@math.ucdavis.edu	Open	Open	Open	Open	Grade 3	Not Open
steve@math.ucdavis.edu	Open	Open	Open	Open	Grade 4	Not Open

SageMathCloud helps you to **conveniently organize a course**: add students, create their projects, see their progress, understand their problems by dropping right into their files from wherever you are. Conveniently handout assignments, collect them, grade them, and finally return them. ([SMC used for Teaching](#) and [learn more about courses](#)).

Jupyter Notebook, Linux Terminal, ...



SageMathCloud does not arbitrarily restrict you. Work with **Jupyter Notebooks**, **upload** your own files, **process** data and results online, and work with a **full Linux terminal**.



Projects

 Deleted Hidden


#480-2016 #480-ent-2014 #480b #ant #bigram #com #delete #demo #dev #dewel #dsctwins
 #edu #family #finance #goe #grant #grants #graz #haskell #haskell #j3 #jmm #kindle
 #lab #mfdo #lus #math #math480 #math480-spr-2016 #mathday #me #modabvar #money
 #mrc #omnibase #org #paper #reco #research #rh #sage #sagedays #scratch #sd58

[Create new project...](#)

hsy: smc development

less than a minute ago

#smc #dev

Harald Schilly (less than a minute ago), William A. Stein (2 months ago), Hal Snyder (4 months ago), Hal W Snyder

Running

SMC Omnibase - 2015/16

2 minutes ago

#dev #omnibase #smc #smc-core

William A. Stein (1 minute ago), Tim Clemans SMC (2 minutes ago), Harald Schilly (5 minutes ago), Hal Snyder (5 minutes ago), John Jeng (15 hours ago), Simon Luu (17 hours)

Running

Notes on Iwasawa theory

2 minutes ago

Notes for Bharath and Yannick on Iwasawa theory, #research

Bharathwaj Palvannan (3 minutes ago), Yannick Van Huele (2 months ago), William A. Stein (7 months ago)

Running

smc-business-wstein

4 minutes ago

William A. Stein (3 minutes ago), Harald Schilly (1 month ago)

Running

Hal SRE

4 minutes ago

sage worksheets et al

Hal Snyder (4 minutes ago), John Jeng (2 weeks ago), Harald Schilly (3 weeks ago), William A. Stein (3 weeks ago), Tim Clemans SMC (1 month ago), Todd

Running



Projects

 Deleted Hidden


#480-2016 #480-ent-2014 #480b #ant #bigram #com #delete #demo #dev #devel #dsctwins
 #edu #family #finance #goe #grant #grants #graz #haskal #haskell #j3 #jmm #kindle
 #lab #mfdo #lus #math #math480 #math480-spr-2016 #mathday #me #modabvar #money
 #mrc #omnibase #org #paper #reco #research #rh #sage #sagedays #scratch #sd58

➕ Create new project...

Notes on Iwasawa theory

less than a minute ago

Notes for Bharath and Yannick on Iwasawa theory, #research

Bharathwaj Palvannan (now), Yannick Van Huele (2 months ago), William A. Stein (7 months ago)

Running

hsy: smc development

less than a minute ago

#smc #dev

Harald Schilly (less than a minute ago), William A. Stein (2 months ago), Hal Snyder (4 months ago), Hal W Snyder

Running

SMC Omnibase - 2015/16

2 minutes ago

#dev #omnibase #smc #smc-core

William A. Stein (2 minutes ago), Tim Clemans SMC (3 minutes ago), Harald Schilly (6 minutes ago), Hal Snyder (6 minutes ago), John Jeng (15 hours ago), Simon Luu (17

Running

smc-business-wstein

4 minutes ago

William A. Stein (3 minutes ago), Harald Schilly (1 month ago)

Running

Hal SRE

4 minutes ago

sage worksheets et al

Hal Snyder (4 minutes ago), John Jeng (2 weeks ago), Harald Schilly (3 weeks ago), William A. Stein (3 weeks ago), Tim Clemans SMC (1 month ago), Todd

Running

Projects - SageMathCloud x

https://cloud.sagemath.com/projects

Projects

William A. Stein About Help 55ms

Tim Ciemans SMC last seen at SMC Omnibase - 2015/16

Deleted Hidden

tim ciemans

Create new project...

Only showing projects whose title, description or users c

Hal SRE less than a minute ago


SMC Omnibase - 2015/16 1 minute ago

RethinkDB - databases 2 hours ago

#480-2016 #480-ent-2014 #480b #ant #bigram #com #delete #demo #dev #devel #dschwins #edu #family #finance #gce #grant #grants #graz #halkal #haskell #j3 #jmm #kindle #lab #lifefdb #luis #math #math480 #math480-spc-2016 #mathday #me #modabvar #money #mrc #omnib

Should We See Everything a Cop Sees?

MAGAZINE | Should We See Everything a Cop Sees?



Tim Ciemans got into police data as a "hobby." Ian Allen for The New York Times

📌 Projects

 Deleted Hidden

#480-2016	#480-ent-2014	#480b	#ant	#bigram	#com	#delete	#demo	#dev	#devel	#dictwins	
#edu	#family	#finance	#goe	#grant	#grants	#graz	#haikal	#haskell	#j3	#jmm	#kindle
#lab	#lmfdb	#luus	#math	#math480	#math480-spr-2016	#mathday	#me	#modabvar	#money		
#mrc	#omnibase	#org	#paper	#reco	#research	#rh	#sage	#sagedays	#scratch	#sd68	

➕ Create new project...

Title

Create project

Cancel

Description

You can **very easily** change the title and description at any time later.

A **project** is your own private computational workspace that you can share with others and upgrade.

<https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/>

Projects TEST

William A. Stein About Help 54ms

Files + New Log Find Settings

Filename Create

Check all

17 items

Terminal command...

<input type="checkbox"/>		2016-10-16-160227.ipynb	2 days ago	582 bytes	
<input type="checkbox"/>		2016-10-06-130541.sagews	2 days ago	679 bytes	
<input type="checkbox"/>		2016-10-16-160125.term	2 days ago	36 bytes	
<input type="checkbox"/>		a.png	2 days ago	14 KB	
<input type="checkbox"/>		new	5 days ago	0 bytes	
<input type="checkbox"/>		xyz	2 weeks ago		
<input type="checkbox"/>		a.term	2 weeks ago	36 bytes	
<input type="checkbox"/>		- b c	2 weeks ago		
<input type="checkbox"/>		2016-10-06-130740.term	2 weeks ago	36 bytes	
<input type="checkbox"/>		2016-10-06-130749.tasks	2 weeks ago	0 bytes	
<input type="checkbox"/>		2016-10-06-130604.synctex.gz	2 weeks ago	830 bytes	
<input type="checkbox"/>		2016-10-06-130604.pdf	2 weeks ago	28.9 KB	
<input type="checkbox"/>		2016-10-06-130604.log	2 weeks ago	3 KB	
<input type="checkbox"/>		2016-10-06-130604.aux	2 weeks ago	8 bytes	
<input type="checkbox"/>		2016-10-06-130604.tex	2 weeks ago	126 bytes	
<input type="checkbox"/>		2016-10-06-130551.ipynb	2 weeks ago	582 bytes	



Projects



TEST



Files



New



Log



Find



Settings



+ Create



Showing files matching tex

Check all

2 items



2016-10-06-130604.synctex.gz



2016-10-06-130604.tex



Projects

✎ TEST



📁 Files

+ New

🔄 Log

🔍 Find

🔧 Settings

Filename



+ Create



🏠 / xyz

Check all

1 item



Parent Directory



a.sagews

```
https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/2016-10-16-160125.term
Projects TEST
Files New Log Find Settings >_2016-10-16-160125.term x
A A C || 2016-10-16-160125.term
Welcome to the SageMathCloud Terminal Environment
Software: sage R ipython gap gp git latexmk isympy java julia octave python3
vim emacs nano joe gcc clang ocaml pdflatex xetex node convert mc http atop ...
Anaconda Python [continuum.io]: anaconda3 Usage: type command and
... and exit it: exit-anaconda then hit the return key
Learn about the Linux terminal: http://ryanstutorials.net/linuxtutorial/
Experiencing any problems or is something missing? email help@sagemath.com

-$
-$ ls
- b c 2016-10-06-130604.log 2016-10-06-130740.term a.png xyz
2016-10-06-130541.sagews 2016-10-06-130604.pdf 2016-10-06-130749.tasks a.term
2016-10-06-130551.ipynb 2016-10-06-130604.synctex.gz 2016-10-16-160125.term new
2016-10-06-130604.aux 2016-10-06-130604.tex 2016-10-16-160227.ipynb william.jpg
-$ pwd
/projects/f3837230-6803-4d59-bda1-6e12394d197c
-$ uptime
15:03:35 up 17:03, 1 user, load average: 8.06, 9.18, 8.22
-$ hostname
compute1-us
-$ █
```

🔧 Settings and configuration

H Title and description

Title

Description

👤 Project usage and quotas

⬇️ Adjust your quotas...
✎ Admin edit...

Member hosting	No
Internet access	Blocked
Idle timeout	1 hour of non-interactive use before project stops <ul style="list-style-type: none">1 hour given by free project
Memory	1000 MB RAM memory available - 147 MB used <ul style="list-style-type: none">1000 MB given by free project

👤 Collaborators

Collaborators can **modify anything** in this project, except backups. They can add and remove other collaborators, but cannot remove owners.

Add collaborators +

William A. Stein (1 minute ago) (owner) ✕ Remove...

⚙️ Project control

State 📄 Running

Actions ⚡ Restart project... 🛑 Stop 💾 Save

Project id

Host

```

(1) TEST - SageMathCloud x
https://cloud.sagemath.com/projects

Projects TEST
Files New Log Find
A A C || 2016-10-11
Welcome to the
Software: sage R ipython g
vim emacs nano joe gcc cla
Anaconda Python [continuum
... and exit
Learn about the Linux term
Experiencing any problems

~$
~$ ls
- b c 20
2016-10-06-130541.sagews 20
2016-10-06-130551.ipynb 20
2016-10-06-130604.aux 20
~$ pwd
/projects/f3837230-6803-4d59
~$ uptime
15:03:35 up 17:03, 1 user,
~$ hostname
compute1-us
~$ █

```

Projects - SageMathCloud

WILLIAM (TEST USER) Stein About Help 50ms

Projects

Deleted Hidden

tes

#smc

Create new project...

Only showing projects whose title, description or users contain **tes** Cancel

TEST	2 minutes ago	William A. Stein (2 minutes ago), WILLIAM (TEST USER) Stein	Running
William TEST USER Stein - xxx	1 month ago	this is it.	Stopped
WILLIAM (TEST USER) Stein - workshop	1 month ago	No description	Running

```
(1) TEST - SageMathCloud
https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/log

Projects TEST
Files New Log Find
A A C || 2016-10-11
Welcome to the
Software: sage R ipython g
vim emacs nano joe gcc cla
Anaconda Python [continuum
... and exit
Learn about the Linux term
Experiencing any problems

~$
~$ ls
- b c 20
2016-10-06-130541.sagews 20
2016-10-06-130551.ipynb 20
2016-10-06-130604.aux 20
~$ pwd
/projects/f3837230-6803-4d59
~$ uptime
15:03:35 up 17:03, 1 user,
~$ hostname
compute1-us
~$
```

William (TEST USER) Stein About Help 50ms

WARNING: This project runs on a free server without internet access — learn more...

Project activity log

Search log... << Newer 1/1 Older >>

- William A. Stein invited user WILLIAM (TEST USER) Stein less than a minute ago
- William A. Stein opened 2016-10-16-160125.term 2 minutes ago
- William A. Stein opened 2016-10-16-160227.ipynb 2 days ago
- William A. Stein opened 2016-10-16-160125.term 2 days ago
- William A. Stein opened 2016-10-06-130551.ipynb 2 days ago
- William A. Stein opened 2016-10-06-130541.sagews 2 days ago
- William A. Stein opened a.png 2 days ago
- William A. Stein opened 2016-10-06-130541.sagews 2 days ago
- William A. Stein set title to TEST 2 days ago
- William A. Stein executed mini terminal command touch new 5 days ago
- William A. Stein set upgrade contributions to: CPU cores: 0 cores, CPU shares: 0 shares, Disk space: 0 MB, Member hosting: 0 upgrades, Memory: 0 MB, Idle timeout: 0 hours, Internet access: 0 upgrades 1 week ago
- William A. Stein downloaded a.png 2 weeks ago
- William A. Stein opened xyz/a.sagews 2 weeks ago
- William A. Stein opened a.term 2 weeks ago
- William A. Stein opened 2016-10-06-130604.tex 2 weeks ago
- William A. Stein opened 2016-10-06-130541.sagews 2 weeks ago
- William A. Stein opened .2016-10-06-130541.sagews.sage-history 2 weeks ago

```
https://cloud.sagemath.com/projects/TEST
Files New Log Find
A A C II 2016-10-16
Software: sage R ipython g
vim emacs nano joe gcc cla
Anaconda Python [continuum
... and exit
Learn about the Linux term
Experiencing any problems
```

```
~$
~$ ls
- b c
2016-10-06-130541.sagews
2016-10-06-130551.ipynb
2016-10-06-130604.aux
~$ pwd
/projects/f3837230-6803-4d59
~$ uptime
15:03:35 up 17:03, 1 user,
~$ hostname
computel-us
~$ whoami
f383723068034d59bda16e12394c
~$
```

```
(1) TEST - SageMathCloud
https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/2016-10-16-160125.term
Projects TEST WILLIAM (TEST USER) Stein About Help 66ms
WARNING: This project runs on a free server without internet access -- learn more...
Files New Log Find Settings >_2016-10-16-160125.term x
A A C II 2016-10-16-160125.term
Welcome to the SageMathCloud Terminal Environment
Software: sage R ipython gap gp git latexmk isympy java julia octave python3
vim emacs nano joe gcc clang ocaml pdflatex xetex node convert mc htop atop ...
Anaconda Python [continuum.io]: anaconda3 Usage: type command and
... and exit it: exit-anaconda then hit the return key
Learn about the Linux terminal: http://ryanstutorials.net/linuxtutorial/
Experiencing any problems or is something missing? email help@sagemath.com
~$
~$ ls
- b c
2016-10-06-130541.sagews 2016-10-06-130604.log 2016-10-06-130740.term a.png xyz
2016-10-06-130551.ipynb 2016-10-06-130604.pdf 2016-10-06-130749.tasks a.term
2016-10-06-130604.aux 2016-10-06-130604.synctex.gz 2016-10-16-160125.term new
/projects/f3837230-6803-4d59-bda1-6e12394d197c 2016-10-06-130604.tex 2016-10-16-160227.ipynb william.jpg
~$ pwd
/projects/f3837230-6803-4d59-bda1-6e12394d197c
~$ uptime
15:03:35 up 17:03, 1 user, load average: 8.06, 9.18, 8.22
~$ hostname
computel-us
~$ whoami
f383723068034d59bda16e12394d197c
~$
```


← → ↻ 🏠 <https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/2016-10>



Projects



TEST



Files



New



Log



Find



Settings

>_ 2016-10-16-160125.term



A

A

C



2016-10-16-160125.term

~\$ ls

- b c	2016-10-06-130604.log	2016-1
2016-10-06-130541.sagews	2016-10-06-130604.pdf	2016-1
2016-10-06-130551.ipynb	2016-10-06-130604.synctex.gz	2016-1
2016-10-06-130604.aux	2016-10-06-130604.tex	2016-1

~\$ open 2016-10-06-130604.tex

```

1 \documentclass{article}
2 \title{Title of Document}
3 \author{William Stein \and
4
5 \begin{document}
6 \maketitle
7
8 $$2+3$$
9
10 kasf alsd jfla sdf1 jasldfj
11 kasf alsd jfla sdf1 jasldfj
12 kasf alsd jfla sdf1 correct
13 kasf alsd jfla sdf1 jasldfj
14 kasf alsd jfla sdf1 jasldfj
15 kasf alsd jfla sdf1 jasldfj
16 kasf alsd jfla sdf1 jasldfj
17 kasf alsd jfla sdf1 jasldfj
18 kasf alsd jfla sdf1 jasldfj
19
20 \end{document}
21

```

[Projects](#) [TEST](#) [WILLIAM \(TEST USER\) Stein](#) [About](#) [Help](#) [54ms](#)

WARNING: This project runs on a free server without internet access — learn more...

[Files](#) [New](#) [Log](#) [Find](#)

[Preview](#) [Issues](#) [PDF](#) [Build](#)

> 2016-10-16-160125.term [2016-10-06-130604.tex](#)

[Preview](#) [Issues](#) [PDF](#) [Build](#)

```

1 \documentclass{article}
2 \title{Title of Document}
3 \author{William Stein \and William Test
4 User}
5 \begin{document}
6 \maketitle
7
8 $$2+3$$
9
10 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
11 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
12 kasf alsd jfla sdf1 correct jasldfj asjd
13 flajs dlf
14 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
15 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
16 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
17 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
18 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
19
20 \end{document}
21

```

Title of Document

William Stein William Test User

October 18, 2016

2 + 3

kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf kasf alsd jfla sdf1 jasldfj asjd flajs dlf

William

asjd

asjd

jasldfj

asjd

asjd

asjd

asjd

Title of Document

Name of Author

October 18, 2016

2 + 3

Any idea how to do this?
less than a minute ago

WILLIAM (TEST USER) Stein
First, consider $E : y^2 = x^3 + 1...$
less than a minute ago

Type a message... [Send]

William A. Stein

Any idea how to do this?

First, consider $E : y^2 = x^3 + 1...$

Then in the next case, consider $y^2 = x^3 + x...$ [Send]

asjd this diff

Exp diff hard

a diff hard slow

hard slow jts

```
1 \documentclass{article}
2 \title{Title of Document}
3 \author{William Stein \and William Test User}
4
5 \begin{document}
6
7 \maketitle
8
9 This is the Fermat Equation:
10
11 $$x^n + y^n = z^n$$
12
13 Mistake^2
14
15 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
16 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
17 kasf alsd jfla sdf1 correct jasldfj asjd flajs dlf
18 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
19 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
20 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
21 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
22 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
23 kasf alsd jfla sdf1 jasldfj asjd flajs dlf
24
25 \end{document}
26
```

Errors

line 13 of 2016-10-06-130604.tex

Missing \$ inserted.

```
<inserted text>
      $
l.13 Mistake^
      2
? No pages of output.
Transcript written on 2016-10-06-130604.log.
```

Typesetting Issues

None

Other Warnings

None



Projects



TEST



SMC Omnibase - 20... ✕



Files



New



Log



Find



Settings

>_ 2016-10-16-160125.term

Filename



+ Create



Check all

16 items



Sage Worksheet (.sagews)

>_ Terminal (.term)

Jupyter Notebook (.ipynb)

LaTeX (.tex)

Markdown (.md)

Task List (.tasks)

Course (.course)

Sage Code (.sage)

Python (.py)

Chat (.sage-chat)

+ Create new files in home directory of project

+ Create a new file or directory

Name your file, folder or paste in a link

2016-10-18-081611

Select the type

SageMath Worksheet

Jupyter Notebook

File

Folder

LaTeX Document

>_ Terminal

Task List

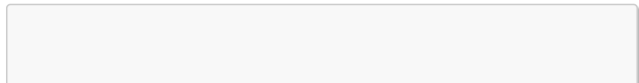
Manage a Course

Download from Internet (internet access blocked -- see project settings)

Create a Chatroom

Upload files from your computer

Drag and drop files (Currently, each file must be under 30MB; for bigger files, use SSH as explained in project settings.)



Worksheet

Jupyter Notebook

Terminal

>_ Terminal

Task List

from Internet (internet access blocked -- see project settings)

Drop files (Currently, each file must be uploaded via SSH as explained in project settings)

File

Folder

- Fortran (.f)
- Go (.go)
- Text/Pari (.gp)
- C++Hdr (.h)
- Haskell (.hs)
- Html (.html)
- Jupyter Notebook (.ipynb)
- Jade (.jade)
- Java (.java)
- Julia (.jl)
- Javascript (.js)
- Lua (.lua)
- Octave (.m)
- Markdown (.md)
- MediaWiki (.mediawiki)

→ **Drop files** to upload

<https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/2016-10-18-081825.sagews>

Projects TEST William A. Stein About Help 53ms

Files New Log Find Settings 2016-10-16-160125.tern 2016-10-18-081825.sagews 2016-10-18-081828.ipynb

Modes Help # Data Control Program x Plots Calculus Linear Graphs Number Theory Rings %sage

```

1
2 1 %time len(str(random_matrix(ZZ, 500).det()))
3
4
5 1 E = EllipticCurve([1,0])
6 2 show(E)
7
8
9 1 plot(E, figsize=[7,2])
10
11
12 1 E.rank()
13
14
15 1 E.torsion_subgroup()
16
  
```

1360
 CPU time: 1.51 s, Wall time: 3.28 s

$$y^2 = x^3 + x$$

Binary Quadratic Form
 Continued Fraction
 Elliptic Curve
 Factor
 Mod \mathfrak{n}
 List Prime Numbers
 Count Prime Numbers

```

14
15 1 E.rank()
16
17
18 1 E.torsion_subgroup()
19
20
21
22
23
24
25
26
27
28
29
30 10
  
```

0
 Torsion Subgroup isomorphic to $\mathbb{Z}/2$ associated to the Elliptic Curve defined by $y^2 = x^3 + x$

1 E.rank()
 0

1 E.torsion_subgroup()
 Torsion Subgroup isomorphic to $\mathbb{Z}/2$ associated to the Elliptic Curve defined by $y^2 = x^3 + x$

show(E.q_expansion(20))
 $q + 2q^5 - 3q^9 - 6q^{13} + 2q^{17} + O(q^{21})$

https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/2016-10-18-081828.ipynb

Projects TEST

William A. Stein About Help 53ms

Files New Log Find Settings 2016-10-16-160125.tern 2016-10-18-081825.sagews 2016-10-18-081828.ipynb

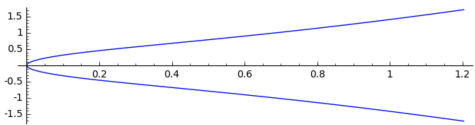
jupyter 2016-10-18-081828 Save TimeTravel Publish About Refresh

File Edit View Insert Cell Kernel Widgets Help SageMath 7.3

Code CellToolbar

```
In [10]: E = EllipticCurve([1,0]); E
Out[10]: Elliptic Curve defined by y^2 = x^3 + x over Rational Field

In [15]: plot(E, figsize=[7,2])
Out[15]:
```



```
In [11]: E.rank()
Out[11]: 0

In [12]: E.torsion_subgroup()
Out[12]: Torsion Subgroup isomorphic to Z/2 associated to the Elliptic Curve defined by y^2 = x^3 + x over Rational Field

In [13]: E.conductor()
Out[13]: 64
```

TEST - SageMathCloud

https://cloud.sagemath.com/projects/f3837230-6803-...

Projects TEST

Files New Log Find Settings > 2016-10-16-160125.term

Run Stop Restart Help in


Modes Help # Data Control Program

```
1 # First a quick benchmark
2 %time len(str(random_matrix(ZZ, 500).det()))
```

1360
CPU time: 1.51 s, Wall time: 3.28 s

```
1 E = EllipticCurve([1,0])
2 show(E)
```

```
1 plot(E, figsize=[7,2])
```



(1) TEST - SageMathCloud

https://cloud.sagemath.com/projects/f3837230-6803-...

Projects TEST

WARNING: This project runs on a free server without internet access — learn more

> 2016-10-16-160125.term

Help in out

Modes Help # Data Control Program

x Plots Calculus Linear Graphs Number Theory

```
1
2 1 # First a quick benchmark
3 2 %time len(str(random_matrix(ZZ, 500).det()))
4
5
6 1 E = EllipticCurve([1,0])
7 2 show(E)
8
9
```

1360
CPU time: 1.51 s, Wall time: 3.28 s

TimeTravel Changes ⏪ ⏩ 9 minutes ago, revision 8 (of 100) [Open File](#) [Revert live version to this](#) William A. Stein

```
1  
2 2 + 3  
3  
4  
5 E = EllipticCurve([1,1])  
6 show(E)  
7  
8  
9 plot(E)  
10  
11  
12
```

Q E A A ⚡

```
1
2 2 + 3
3
4
5 E = EllipticCurve([1,1])
6 show(E)
7
8
9 plot(E)
10
```

$$y^2 = x^3 + x + 1$$

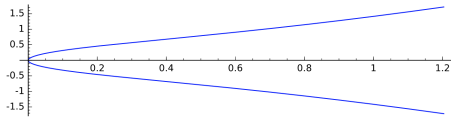
TimeTravel 2016-10-16-160125.term 3 minutes ago, revision 63 (of 100)

Open File Revert live version to this

William A. Stein

```
2 %time random_matrix(ZZ,200).det()
3 -3556531690592011315988789181868810883202201753332092285352054015717689526044961929339936258187291421255803202949614097148301105177283
  CPU time: 0.09 s, Wall time: 0.12 s
4
5 E = EllipticCurve([1,0])
6 show(E)
7
8
9 plot(E, figsize=[7,2])
10
11
12 E.rank()
13 0
```

$$y^2 = x^3 + x$$



Q	E	A	A	f
---	---	---	---	---

```

13 13 | 0
14 14 |
15 15 | E.torsion_subgroup()
16 16 | Torsion Subgroup isomorphic to Z/2 associated to the Elliptic Curve defined by y^2 = x^3 + x over Rational Field
17 17 |
18 18 | show(E.q_expansion(50))
19 17 |
18 18 | show(E.q_expansion(20))
19 |
    |
    |      
$$q + 2q^5 - 3q^9 - 6q^{13} + 2q^{17} + O(q^{20})$$

20 20 |
20 22 |
21 23 |
22 24 |
    
```

TimeTravel

Changes

3 minutes ago to 2 minutes ago, revisions 96 to 100 (of 100)

Open File Revert live version to this

Project: TEST, WILLIAM (TEST USER) Stein

Q E A A f

```
1
2 # First a quick benchmark
3 %time len(str(random_matrix(ZZ, 500).det()))
4      1360
5      CPU time: 1.51 s, Wall time: 3.28 s
6
15 E = EllipticCurve([1,0])
16
17 E.torsion_subgroup()
18 Torsion Subgroup isomorphic to Z/2 associated to the Elliptic Curve defined by y^2 = x^3 + x over Rational Field
19 show(E.q_expansion(20))
20
21
22
23
24
```

$$q + 2q^5 - 3q^9 - 6q^{13} + 2q^{17} + O(q^{20})$$
$$q + 2q^5 - 3q^9 - 6q^{13} + 2q^{17} + O(q^{20})$$



William A. Stein

jupyter 2016-10-18-081828

```
In [1]: 2+3
Out[1]: 5

In [2]: E = EllipticCurve([1,1])
        show(E)
        [Math Processing Error]

In [ ]: plot(E)

In [ ]:
```


Browser address bar: <https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/2016-10-18-081828.ipynb.sage-history>

Projects TEST

William A. Stein About Help 57ms

TimeTravel 10 minutes ago, revision 9 (of 17)

Open File Revert live version to this

William A. Stein

Jupyter 2016-10-18-081828

In [1]: `2+3`

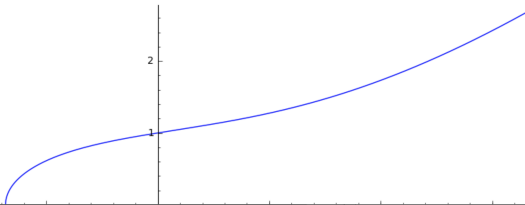
Out[1]: 5

In [4]: `E = EllipticCurve([1,1]); E`

Out[4]: Elliptic Curve defined by $y^2 = x^3 + x + 1$ over Rational Field

In [3]: `plot(E)`

Out[3]:



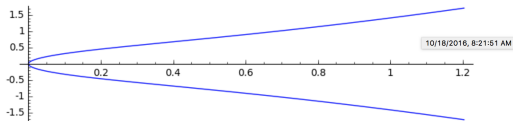
jupyter 2016-10-18-081828

```
In [10]: E = EllipticCurve([1,0]); E
```

```
Out[10]: Elliptic Curve defined by  $y^2 = x^3 + x$  over Rational Field
```

```
In [15]: plot(E, figsize=(7,2))
```

```
Out[15]:
```



```
In [11]: E.rank()
```

```
Out[11]: 0
```

```
In [12]: E.torsion_subgroup()
```

```
Out[12]: Torsion Subgroup isomorphic to  $\mathbb{Z}/2$  associated to the Elliptic Curve defined by  $y^2 = x^3 + x$  over Rational Field
```

```
In [13]: E.conductor()
```

#docker /projects permissions

Ideas:

- just fix on on startup
- print error on startup

Close

#docker /projects permissions

Ideas:

- just fix on on startup
- print error on startup

#open revive diff-match-patch

#jupyter #docker jupyter issues in docker?

#import disable video chat option?

Su	Mo	Tu	We	Th	Fr	Sa
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

<https://cloud.sagemath.com/projects/6cd832d3-c523-41e3-9e54-c8f2d2e8fa2a/files/travel/2016/2016-10-san-diego/sd-todo.tasks.sage-history>

Projects smc-business-wstein William Stein person... William A. Stein About Help 52ms

Files New Log Find Settings sd-todo.tasks sd-todo.tasks.sage-history

TimeTravel a day ago, revision 39 (of 59) Open File Revert live version to this William A. Stein

Find task... Done Deleted Showing 11 tasks.

Custom Order ▼ Due Changed

<input type="checkbox"/>	/projects permissions	none
<input type="checkbox"/>	revive diff-match-patch	none
<input type="checkbox"/>	jupyter issues in docker?	none
<input type="checkbox"/>	disable video chat option?	none
<input type="checkbox"/>	cursor on dark background in terminal	none
<input type="checkbox"/>	jupyter not working on k8s in firefox	none
<input type="checkbox"/>	format using markdown (LINK)	none
<input type="checkbox"/>	admin user + rethinkdb password (?)	none

TimeTravel 2 minutes ago, revision 51 (of 59) Open File Revert live version to this

William A. Stein

Find task... Done Deleted Showing 11 tasks.

	Custom Order	Due	Changed
<input type="checkbox"/>	#docker /projects permissions	none x	
<input type="checkbox"/>	#open revive diff-match-patch	none	
<input type="checkbox"/>	#jupyter #docker jupyter issues in docker?	none	
<input type="checkbox"/>	#import disable video chat option?	none	
<input type="checkbox"/>	#bug #ui cursor on dark background in terminal	none	
<input type="checkbox"/>	jupyter not working on k8s in firefox	none	
<input type="checkbox"/>	format using markdown (LINK)	none	
<input type="checkbox"/>	admin user + rethinkdb password (?)	none	

<https://cloud.sagemath.com/projects/6cd832d3-c523-41e3-9e54-c8f2d2e8fa2a/files/travel/2016/2016-10-san-diego/sd-todo.tasks.sage-history>

Projects smc-business-wstein William Stein person... William A. Stein About Help 53ms

Files New Log Find Settings sd-todo.tasks .sd-todo.tasks.sage-history

TimeTravel about a minute ago, revision 56 (of 59) Open File Revert live version to this

William A. Stein

Find task... Done Deleted Showing 11 tasks.

Custom Order ▼ Due Changed

<input type="checkbox"/>	#docker /projects permissions Ideas for fix: <ul style="list-style-type: none"> just fix on on startup print error on startup 	none x	
<input type="checkbox"/>	#open revive diff-match-patch	none	
<input type="checkbox"/>	#jupyter #docker jupyter issues in docker?	none	
<input type="checkbox"/>	#import disable video chat option?	none	
<input type="checkbox"/>	#bug #ui cursor on dark background in terminal	none	
<input type="checkbox"/>	#firefox #bug #jupyter #docker jupyter not working on docker (k&s.sagemath.org) in firefox	none	
<input type="checkbox"/>		none	

<https://cloud.sagemath.com/projects/4d0f1d1d-7b70-4fc7-88a4-3b4a54f77b18/files/>

Projects math480-2016 TEST

William A. Stein About Help 73ms

Files New Log Find Settings

Filename Create

Check all

22 items

Backups Add Collaborators Terminal command...

<input type="checkbox"/>		math480.course	3 months ago	369.2 KB	
<input type="checkbox"/>		fake	4 months ago		
<input type="checkbox"/>		grades-final.txt	5 months ago	20.9 KB	
<input type="checkbox"/>		math480-grading.sagews	5 months ago	16.3 KB	
<input type="checkbox"/>		math480.pyc	5 months ago	11.2 KB	
<input type="checkbox"/>		math480.py	5 months ago	12 KB	
<input type="checkbox"/>		grades.txt	5 months ago	21.8 KB	
<input type="checkbox"/>		480.tasks	5 months ago	6.8 KB	
<input type="checkbox"/>		lectures	5 months ago		
<input type="checkbox"/>		term.term	5 months ago	36 bytes	

Browser address bar: <https://cloud.sagemath.com/projects/4d0f1d1d-7b70-4fc7-88a4-3b4a54f77b18/files/math480.course>

Navigation tabs: Projects, math480-2016, TEST

Top bar: William A. Stein, About, Help, 64ms

File explorer: Files, New, Log, Find, Settings, math480.course

Project controls: Students (51), Assignments (36), Handouts (0), Settings, Save, TimeTravel

Project title: math480 - open source mathematical so...

Project type: Shared Project

Search: Find assignments... Add assignment by folder name (enter to see available folders)...

- ▶ assignments/DUE-2016-04-22/problem-3
- ▶ assignments/DUE-2016-05-27
- ▶ grading-guidelines/DUE-2016-04-15-grading-guidelines
- ▶ lectures/2016-03-28
- ▶ lectures/2016-03-30
- ▶ lectures/2016-04-01
- ▶ lectures/2016-04-04
- ▶ lectures/2016-04-06
- ▶ lectures/2016-04-08
- ▶ lectures/2016-04-11
- ▶ lectures/2016-04-13

Due Friday, April 01, 2016 6:00 PM



Peer Grading...

Delete

Assign...

Collect...

Return...

1. Assign to Student

2. Collect from Student

3. Grade

4. Return to Student

Assign...

Open

(7 months ago)

Collect...

Open

(7 months ago)

Enter grade

Grade: 19.5/20

Return...

Open

(7 months ago)

Assign...

Open

(7 months ago)

Collect...

Open

(7 months ago)

Enter grade

Grade: 16/20

Return...

Open

(7 months ago)

Assign...

Open

(7 months ago)

Collect...

Open

(7 months ago)

Enter grade

Grade: 19.5/20

Return...

Open

(7 months ago)

Assign...

Open

(7 months ago)

Collect...

Open

(7 months ago)

Enter grade

Grade: 19/20

Return...

Open

(7 months ago)

Assign...

Open

(7 months ago)

Collect...

Open

(7 months ago)

Enter grade

Grade: 20/20

Return...

Open

(7 months ago)

Assign...

Open

(7 months ago)

Collect...

Open

(7 months ago)

Enter grade

Grade: 18/20

Return...

Open

(7 months ago)

Assign...

Open

Collect...

Open

Enter grade

Return...

Open

Search in home directory of project

- Include subdirectories
- Case sensitive search
- Include hidden files

[Navigate to a different folder](#) to search in it.

Results of searching in  for "Elliptic" [using grep...](#)

```
2016-10-18-081825.sagevs E = EllipticCurve([1,0])
2016-10-18-081825.sagevs {"stdout":"Torsion Subgroup isomorphic to Z/2 associated to the Elliptic Curve defined by y^2 = x^3 + x over
Rational Field\n\n"}{"done":true}
2016-10-18-081828.ipynb "Elliptic Curve defined by y^2 = x^3 + x over Rational Field"
2016-10-18-081828.ipynb "E = EllipticCurve([1,0]); E"
2016-10-18-081828.ipynb "Torsion Subgroup isomorphic to Z/2 associated to the Elliptic Curve defined by y^2 = x^3 + x over Rational Field"
```

Project control

State

 Running

Actions

 Restart project...

 Stop

 Save


Project id

f3837230-6803-4d59-bda1-6e12394d197c

Host

compute1-us.sagemath.com

If your project is not working, please create a [support ticket](#).

 SSH into your project...

Sage worksheet server

Restart this Sage Worksheet server.

Existing worksheet sessions are unaffected; restart this server if you customize \$HOME/bin/sage, so that restarted

 Restart Sage
Worksheet Server

<https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/foo.html>
Projects TEST
William A. Stein
About
Help
63ms

Files
New
Log
Find
Settings
foo.html
>.. 2016-10-16-160125.term

B *I* U
A- Tl H- A- A-

Save TimeTravel

```

1 <h1>
2   My HTML Page
3 </h1>
4
5 <ul>
6   <li>Math works:  $x^3$ </li>
7 </ul>
8
9

```

My HTML Page

- Math works: x^3

Chat here about this.
now

Type a message... >

← → ↻ 🏠 <https://cloud.sagemath.com/projects/f3837230-6803-4d59-bda1-6e12394d197c/files/foo.md> 🔍 ☆ ⋮

Projects TEST × William A. Stein ? About 🛠 Help 🔔 📶 60ms

Files + New ↻ Log 🔍 Find ⚙ Settings >_ 2016-10-16-160125.term × foo.md ×

B I U ↵ x₂ x² 💬 \$ \$\$ ☰ ☷ 🔗 🖼 🗄 - Ω ☰ ☷ ☰ ☷ × A- Tl- H- A- A-

⏪ ↻ ⏩ C Q = 📅 A A ⚡ 🛑 Save ⌛ TimeTravel

```
1 # My MD file
2
3 - yes math works: $x^3$
4
5 -
```

My MD file

- yes math works: x^3
-

Serif
Sans
Arial
Arial Black
Courier
Courier New
Comic Sans MS
Georgia
Helvetica
Impact
Lucida Grande
Lucida Sans
Monaco
Palatino
Tahoma
Times New Roman

another chat.... now

Type a message... 🗨

Account Settings Billing Upgrades Support

Account settings

First name

Last name

Email address

Password

Linked accounts (only used for sign in)

Terminal (settings applied to newly opened terminals)

Terminal font size px

Terminal font family

Editor (settings apply to newly (re-)opened files)

Font Size px

Autosave interval seconds

Editor color scheme

Editor keyboard bindings

- Line wrapping: wrap long lines
- Line numbers: show line numbers
- Code folding: fold code using control+Q
- Smart indent: context sensitive indentation
- Electric chars: sometimes reindent current line
- Match brackets: highlight matching brackets near cursor
- Auto close brackets: automatically close brackets
- Match XML tags: automatically match XML tags
- Auto close XML tags: automatically close XML tags
- Strip trailing whitespace: remove whenever file is saved
- Show trailing whitespace: show spaces at ends of lines
- Spaces instead of tabs: send 4 spaces when the tab key is pressed
- Extra button bar: more editing functions (mainly in Sage worksheets)

In case of any questions or problems
We want to know
You can also send an email
In such an email, please include the
The SageMathCloud

SageMathCloud

Support

- SageMathCloud documentation
- Pricing and subscription options
- Teaching a course with SageMathCloud
- List of courses that use SageMathCloud
- Realtime chat and help
- Complete source code (SageMathCloud is 100% open source)
- Github issue tracker
- Support mailing list
- Developer mailing list
- Blog
- Google+ updates
- Google+ William Stein development updates
- Twitter the Twitter feed

Search...

Mark all Read

- smc/src/smc-webapp/editor_chat.tex** in *Simon Liu's SMC Project* discussed by Simon Liu (22 hours ago), John Jeng (3 months ago)
- trying_out_new_features** sagemws in *SMC Omnibase - 2015/16* discussed by Hal Snyder (5 days ago), Tim Clemans SMC (6 days ago), You (3 weeks ago)
- smc/src/smc-util/test/misc-test.coffee** in *hsy: smc development* edited by Harald Schilly (less than a minute ago), You (7 months ago)
- Bharath/projectivity-of...awa-modules/projectivity.tex** in *Notes on Iwasawa theory* edited by Bharathwaj Palvannan (less than a minute ago), You (7 months ago)
- foo.md** in *TEST* edited by You (less than a minute ago)
- 2016-10-16-160125.term** in *TEST* edited by You (2 minutes ago), WILLIAM (TEST USER) Stein (38 minutes ago)
- foo.html** in *TEST* edited by You (2 minutes ago)
- Bharath/projectivity-of-iwasawa-modules/macro.sty** in *Notes on Iwasawa theory* edited by Bharathwaj Palvannan (2 minutes ago)
- Stephanie/2016-07-04-132419** sagemws in *Summer 2016 Oxford* edited by Stephanie Chan (7 minutes ago)
- work/2016-10-18.sage-chat** in *SMC Omnibase - 2015/16* edited by You (8 minutes ago), Tim Clemans SMC (45 minutes ago), Harald Schilly (53 minutes ago), Hal Snyder (55 minutes ago)