2014-04-07.sagews

April 7, 2014

Contents


```
%md

# Math 480b -- Sage Course

## April 7, 2014

Screencast: <http://youtu.be/iWWHpafc4Lc>

**Plan**

- Questions?
- Homework 1 grading
- Python
   - data types: string, integer, list, tuple, dict
   - list comprehensions
   - functions
   - Python variables are references
   - putting code in files/modules and loading them

- NEXT: classes
```

1 Math 480b Sage Course

1.1 April 7, 2014

Screencast: REMEMBER TO START IT!!!!
Plan

- Questions?
- Homework 1 grading

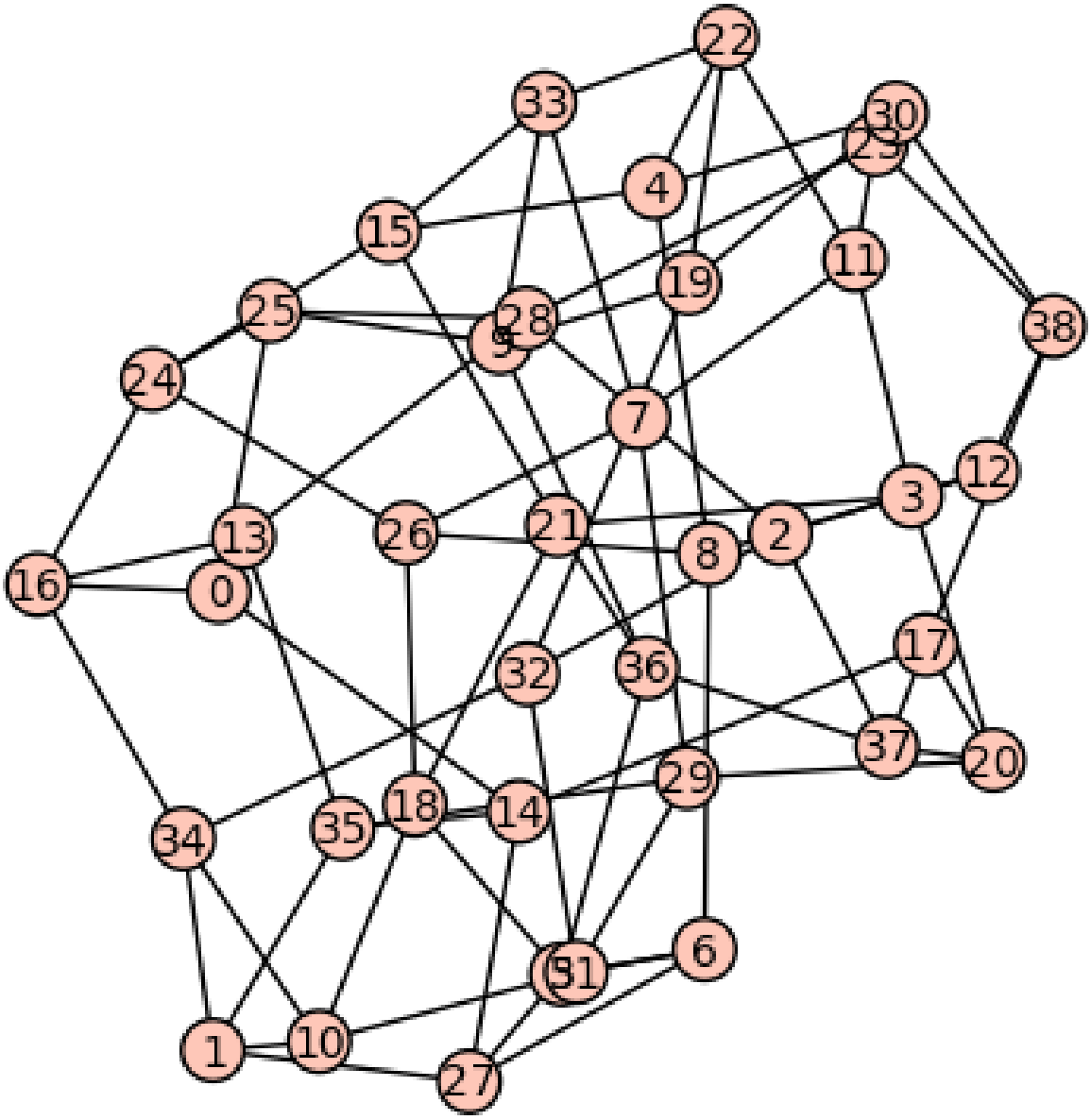
- Python
  - data types: string, integer, list, tuple, dict
  - list comprehensions
  - functions
  - Python variables are references
  - putting code in files/modules and loading them
- NEXT: classes

```
2+3
```
```
5
```

```
graphs.RandomBipartite(5,5,0.5)
```
```
Random bipartite graph of size 5+5 with edge probability 0.500000000000000: Graph on 10
vertices
```

```
g = graphs.RandomRegular(4, 39, 1)
```

```
g.plot()
```




```
g = graphs.RandomRegular(3, 39)
```

```
g
```

```
False
```

```
2+3
```

```
5
```

1.2 Python - Data types str, int and long, float, list, tuple, dict, etc.

```
s = "this is a string"
s
```
```
'this is a string'
```

```
s.capitalize
```
```
<built-in method capitalize of str object at 0xa5088f0>
```

```
s.capitalize()
```
```
'This is a string'
```

```
s[4] = 'x'
```
```
Error in lines 1-1
Traceback (most recent call last):
  File "/projects/edf7b34d-8ef9-49ad-b83f-8fa4cde53380/.sagemathcloud/sage_server.py",
line 733, in execute
    exec compile(block+'\n', '', 'single') in namespace, locals
  File "", line 1, in <module>
TypeError: 'str' object does not support item assignment
```

```
t = s[:4] + 'x' + s[5:]
t
```
```
'thisxis a string'
```

```
s
```
```
'this is a string'
```

```
id(s)
```
```
173050096
```

```
id(t)
```
```
176298224
```

```
s.replace(' ', 'x')
```
```
'thisxisxaxstring'
```

```
'ng foo bar ngng'.strip('ng')
```
```
' foo bar '
```

```
'ng foo bar ngngnnnn'.strip('gn')
```
```
' foo bar '
```

```
u'lkjdfjdn '
```
```
u'lkjdfjdn '
```

```
int
```
```
<type 'int'>
```

```
a = int(938402340238402); b = int(982302384092)
type(a), type(b)
```
```
(<type 'int'>, <type 'int'>)
```

```
c = a*b
type(c)
```
```
<type 'long'>
```

```
c
```
```
92179485605369442825230098 4L
```

```
a/b
```
```
955
```

```
c_sage = Integer(c)
type(c_sage)
```
```
<type 'sage.rings.integer.Integer'>
```

```
c_sage.prime_factors()
```
```
[2, 13, 61, 1049, 1901, 16063, 164767, 2117743]
```

```
n_int = int(1)
n_long = long(1)
n_sage = 1
n_pari = pari(1)
n_gap = gap(1)
n_singular = singular(1)
n_octave = octave(1)
n_r = r(1)
```

```
n_int, n_long, n_sage, n_pari, n_gap, n_singular, n_octave, n_r
```
```
(1, 1L, 1, 1, 1, 1,  1, [1] 1)
```

- dictionaries
- list

```
d = {'this':3/5,    (2/5):[1,2,3],   'another_key':17}
```

```
type(d)
```
```
<type 'dict'>
```

```
d['this']
```
```
3/5
```

```
d[2/5]
```
```
[1, 2, 3]
```

```
d['this'] = x^3 + sin(x)
d
```
```
{'this': x^3 + sin(x), 'another_key': 17, 2/5: [1, 2, 3]}
```

```
for z in d:
    print z
```

```
this
another_key
2/5
```

```
d['this'](x=pi)
```
```
pi^3
```

```
v = [1,2,3,4,5]
w = dict([(n,True) for n in v])
w
```
```
{1: True, 2: True, 3: True, 4: True, 5: True}
```

```
5 in v
```
```
True
```

```
5 in w
```
```
True
```

```
v = [1, 2, [3,4], {'a':5, 'the':2}]
type(v)
```
```
<type 'list'>
```

```
v[4]
```
```
Error in lines 1-1
Traceback (most recent call last):
  File "/projects/edf7b34d-8ef9-49ad-b83f-8fa4cde53380/.sagemathcloud/sage_server.py",
line 733, in execute
    exec compile(block+'\n', '', 'single') in namespace, locals
  File "", line 1, in <module>
IndexError: list index out of range
```

```
v[2]
```
```
[3, 4]
```

```
v[-1]
```
```
{'a': 5, 'the': 2}
```

```
v[1:3]
```
```
[2, [3, 4]]
```

```
v
```
```
[1, 2, [3, 4], {'a': 5, 'the': 2}]
```

```
v[1] = 'two'
v
```
```
[1, 'two', [3, 4], {'a': 5, 'the': 2}]
```

```
v = [1, 2, [3,4], {'a':5, 'the':2}]
v
```
```
[1, 2, [3, 4], {'a': 5, 'the': 2}]
```

```
v2 = copy(v)
```

```
v2[2][0] = 389
v2
```
```
[1, 2, [389, 4], {'a': 5, 'the': 2}]
```

```
v
```
```
[1, 2, [389, 4], {'a': 5, 'the': 2}]
```

```
v is v2
```
```
False
```

```
import copy
v2 = copy.deepcopy(v)
```

```
v2[2][0] = 9830048284
v2
```
```
[1, 2, [9830048284, 4], {'a': 5, 'the': 2}]
```

```
v
```
```
[1, 2, [389, 4], {'a': 5, 'the': 2}]
```

```
v[0]=v
v
```
```
[[...], 2, [389, 4], {'a': 5, 'the': 2}]
```

1.3 Python - Functions (again)

1.4 Python - Variables are references !

There is a major difference between how the math-oriented programming languages (Matlab, Pari, Maple, etc.) work, and how most modern mainstream programming languages, such as Python, work.

```
octave = Octave()
```

```
%octave
v = [3,4]; w = v; w(1)=2014
```
```
w =

 2014 4
```

```
%octave
v
```
```
v =

 3 4
```

```
#python
v = [3,4]; w = v; w[0]=2014
w
```
```
[2014, 4]
```

```
v
```
```
[2014, 4]
```

```
id(w)
id(v)
```
```
181256776
181256776
```

```
w is v  # same object in memory
```
```
True
```

```
w == v
```
```
True
```

```
v2 = copy(v)
v2
```
```
[2014, 4]
```

```
v is v2
```
```
False
```

```
v == v2
```
```
True
```

1.5 Putting code in files/modules and loading it

WARNING: The Sage preparser!

- import
- reload
-

```
%default_mode python
```

```
2/3
```
```
0
```

```
3^8
```
```
11
```

```
%default_mode sage
```

```
2/3
```
```
2/3
```

```
%python
2/3
```
```
0
```