Administrivia
Homework #8 is due Monday, Oct. 24.
Office hours change from Wed to Thu this week (check website).
NameError: name 'y' is not defined.
Which of the following produces this error?

A  x = 1
   y = x * 2
B  x = 0
   y += 1
C  x = 'ABCD'
   y = x[2]
NameError: name 'y' is not defined.
Which of the following produces this error?

A  \[ \begin{align*}
    x &= 1 \\
    y &= x \times 2
\end{align*} \]

B  \[ \begin{align*}
    x &= 0 \\
    y &= 1
\end{align*} \]

C  \[ \begin{align*}
    x &= 'ABCD' \\
    y &= x[2]
\end{align*} \]
IndexError: list index out of range.
Which of the following produces this error?

A  \[ x = 'ABCD' + 'E' \]
   \[ x[5] \]

B  \[ x = [ 1,2 ] \]
   \[ x[2] \]

C  \[ x = \{ 1:2, 2:3 \} \]
   \[ y = x[2] \]
IndexError: list index out of range.
Which of the following produces this error?

A  \( x = 'ABCD' + 'E' \)
   \( x[5] \)

B  \( x = [1,2] \)
   \( x[2] \)

C  \( x = \{1:2, 2:3\} \)
   \( y = x[2] \)
SyntaxError: invalid syntax.
Which of the following produces this error?

A if x < 'HAPPY':
   print(x.lower()[1])

B if x in 'ABCD':
   print('E' + x[0])

C if x = (1,2,3):
   print(x[2] + 1)
SyntaxError: invalid syntax.
Which of the following produces this error?

A  if x < 'HAPPY':
    print(x.lower()[1])

B  if x in 'ABCD':
    print( 'E' + x[0] )

C  if x = (1,2,3):
    print( x[2] + 1 )
Numerical Python (numpy)
The problem

```
mydata = [ 4.5, 6.0, 1.2, 5.4 ]
from math import sin
sin(mydata)

➤ Why doesn’t this work?
➤ list can contain any type!
➤ Also operators don’t do what we “want”:
mydata * 2.0  # doesn’t double values!
```
```python
import numpy
import numpy as np  # better way

# numpy provides arrays and mathematical functions.
data = np.array([4.5, 6.0, 1.2, 5.4])
data * 2.0
```
Consider a data set containing patient inflammation records for 60 patients over a period of 40 days, contained in inflammation.csv.

```python
data = np.loadtxt( './data/inflammation.csv', delimiter=',' )
```
**numpy**

Max for each patient
`data.max(axis=1)`

Average for each day
`data.mean(axis=0)`
Plotting (matplotlib)
import matplotlib.pyplot as plt
# matplotlib inline # jupyter only

- A plotting environment similar to MATLAB.
- Can plot lists or arrays.
  
  \[
  \begin{align*}
  xs &= \text{list}( \text{range}(4) ) \\
  ys &= [ 4.5, 6.0, 1.2, 5.4 ]
  \end{align*}
  \]

  plt.plot( xs, ys )
  plt.show()
Always include labels:

- `plt.xlabel('domain')`
- `plt.ylabel('range')`
- `plt.title('topical data')`

```python
plt.plot(xs, ys)
plt.xlabel('x')
plt.ylabel('y')
plt.title('some values')
plt.show()
```
Basic cycle:
- Add data to plot.
- Add labels to plot.
- Show plot.
Two kinds of plots today:

- `plt.plot(x, y)` # for ptwise data
- `plt.imshow(A)` # for array data

`plot`: third argument is `format string` (optional).

```python
plt.plot(xs, ys, 'r.'
plt.show()
```

`plot`: can also take keyword arguments.

```python
plt.plot(xs, ys, 'r.', label='height')
plt.show()
```
Reminders
Reminders

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