Arithmetic on Squiggles

Let's "import" so-called "modules" that add features to our programming language ("Python").

In [1]:

```
import numpy as np
import matplotlib.pyplot as pt
```

Here are two 'squiggles' represented as a bunch of numbers:

In [2]:

```
squiggle_1 = "141.03 291.04 141.28 291.50 141.92 291.50 142.67 291.04 143.94 290
.13 145.58 288.32 147.22 285.25 149.62 281.27 152.40 276.15 155.31 270.24 158.21
264.10 161.37 258.19 164.02 252.96 166.67 248.41 168.69 244.89 170.72 241.82 172
.48 239.55 174.25 237.84 175.52 236.59 176.27 236.13 176.65 236.48 176.65 237.50
177.03 240.00 177.41 244.21 177.79 250.12 178.04 257.39 178.04 265.12 178.42 273
.08 178.67 280.93 179.05 288.43 179.56 295.71 179.94 302.64 180.69 309.01 181.71
314.35 182.72 318.10 183.85 320.03 184.86 321.06 186.00 320.72 187.52 319.35 189
.28 316.40 191.31 311.39 193.33 304.35 195.60 295.93 198.00 286.84 200.65 277.86
203.56 269.67 206.21 262.62 208.61 257.17 210.51 253.07 212.02 250.23 213.03 248
.64 213.79 247.84 214.17 247.73 214.17 248.53 214.17 250.35 214.04 253.53 213.92
258.19 213.66 263.99 213.54 270.13 213.41 276.38 213.41 282.18 213.92 287.41 214
.80 291.84 216.32 295.48 218.21 298.09 220.11 299.80 222.13 300.59 224.27 300.71
226.55 300.03 228.95 298.43 231.22 295.71 233.24 292.07 235.26 287.07 237.16 280
.81 239.31 273.76 241.83 265.81 244.86 257.39 248.15 249.21 251.68 241.14 255.09
233.63 258.00 227.27 260.40 222.49 261.92 219.54 262.80 218.63 263.18 218.63 263
.18 219.88 263.05 222.49 262.55 226.93 261.92 233.75 261.03 242.16 260.40 251.82
260.27 262.40 260.53 273.08 260.91 284.11 261.79 294.91 262.80 304.35 264.44 312
.30 266.72 317.99 269.12 321.63 271.64 323.56 274.17 324.69 276.95 324.47 279.98
322.42 283.26 318.56 286.42 311.96 289.83 303.21 293.24 292.98 296.78 282.18 300
.32 272.17 303.60 263.42 306.38 256.60 308.65 251.82 310.04 248.75 310.93 247.50
311.18 247.96 311.05 248.98 310.93 250.91 310.80 253.98 310.55 258.76 310.42 265
.12 310.17 272.74 310.55 280.81 311.31 289.00 312.57 296.50 314.46 302.64 316.86
307.41 319.77 310.37 322.80 311.73 325.96 312.08 328.86 311.17 331.64 309.01 334
.29 304.91 336.82 299.00 339.47 291.73 342.38 283.43 345.54 275.13 348.95 267.51
352.36 260.69 355.14 255.57 357.03 252.16 358.17 250.46 358.55 250.23 358.55 250
.69 358.80 251.94 359.43 254.32 360.06 258.19 360.69 264.33 361.20 271.95 361.71
280.59 362.59 289.23 363.98 296.84 366.00 303.44 368.53 308.44 371.56 311.73 375
.22 313.33 379.26 312.64 383.81 310.26 388.74 306.62 394.29 301.50 "
squiggle_2 = "243.60 219.20 243.60 218.06 242.84 216.92 242.21 215.67 241.07 214
.19 239.56 212.60 237.66 211.01 235.26 209.65 232.23 208.62 228.82 207.60 225.03
206.92 220.86 206.46 216.57 206.12 212.27 206.80 207.60 208.05 202.80 210.33 198
.13 213.74 193.20 217.72 188.78 222.15 184.74 226.59 181.45 231.13 178.93 235.91
177.28 241.02 176.27 246.59 175.89 252.62 176.27 258.99 177.28 265.81 178.93 272
.85 181.33 279.79 184.74 286.38 188.91 292.64 193.83 298.32 199.52 303.78 205.71
308.67 212.40 312.99 219.60 316.62 226.80 319.69 234.00 322.19 241.20 323.90 248
.27 324.81 255.60 325.26 262.93 324.81 270.25 323.90 277.96 322.53 285.54 320.60
293.12 318.56 300.32 316.17 306.63 313.33 312.44 310.14 317.75 306.39 322.80 301
.96 327.60 296.73 332.15 290.82 336.44 284.11 340.48 276.83 344.15 269.22 347.05
261.60 349.07 253.98 350.34 246.59 350.59 239.20 349.83 231.59 348.19 223.63 345
.41 215.67 341.75 208.17 337.07 201.35 331.77 195.66 326.21 191.12 320.65 187.48
315.09 184.75 309.16 182.93 302.84 182.02 296.02 181.91 288.82 182.36 281.87 183
.27 274.93 184.52 268.11 185.89 261.54 187.25 255.35 188.61 249.66 190.21 244.86
191.68 240.82 193.28 237.03 194.87 233.87 196.57 230.97 198.28 228.44 199.98 226
.42 201.69 224.65 203.51 223.52 205.55 222.51 207.94 221.75 210.78 221.24 213.97
220.74 217.72 220.48 221.24 220.23 224.43 219.85 227.04 219.22 229.20 218.72 230
.91 218.21 232.04 217.83 232.72 217.71 233.07 217.33 233.07 216.95 232.50 216.06
231.13 215.43 228.86 215.05 225.56 "
```

"Parsing" those turns them from strings into arrays of numbers:

In [3]:

```
def parse_squiggle(s):
    numbers = [float(num) for num in s.split()]
    a = np.array(numbers)
    return a.reshape(-1, 2).T
```

In [4]:

```
s1 = parse_squiggle(squiggle_1)
s2 = parse_squiggle(squiggle_2)
```

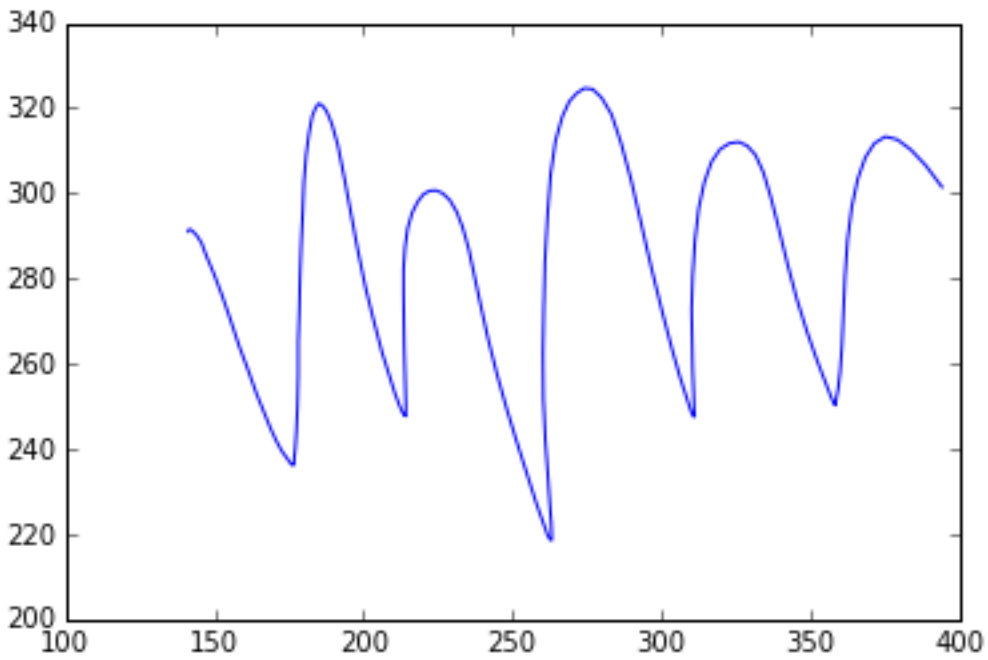
Let's plot both squiggles.

In [5]:

```
pt.plot(s1[0], s1[1])
```

Out[5]:

```
[<matplotlib.lines.Line2D at 0x1055994d0>]
```

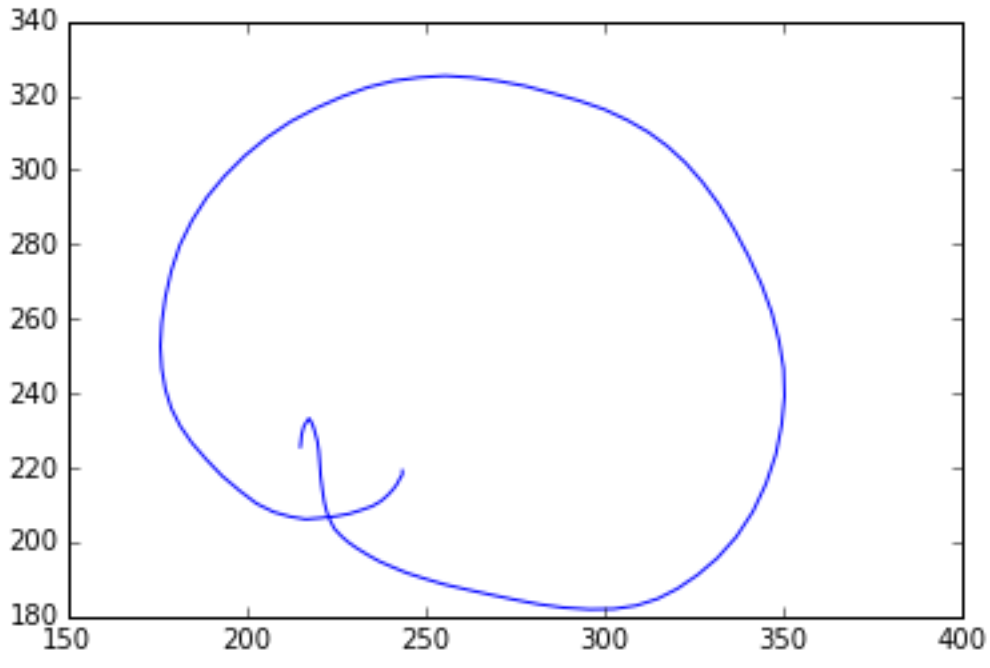


In [6]:

```
pt.plot(s2[0], s2[1])
```

Out[6]:

```
[<matplotlib.lines.Line2D at 0x1056de290>]
```



Will this work?

In [7]:

```
s1 + s2
```

```
---------------------------------------------------------------------
-------
ValueError                                Traceback (most recent cal
l last)
<ipython-input-7-abfe06e9f06f> in <module>()
      1 #keep
----> 2 s1 + s2

ValueError: operands could not be broadcast together with shapes (2,
159) (2,105)
```

So we'll need to do something.

In [8]:

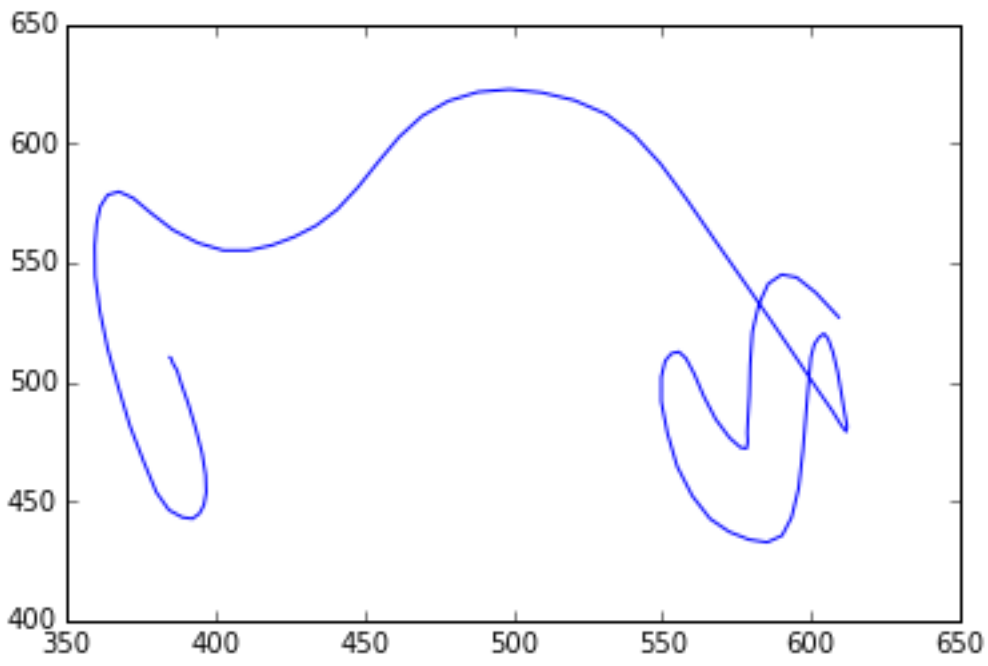
```
from scipy.interpolate import interp1d

_, ns1 = s1.shape
_, ns2 = s2.shape

s1x_interp = interp1d(np.linspace(0, 1, ns1), s1[0])
s1y_interp = interp1d(np.linspace(0, 1, ns1), s1[1])

s1_new = np.array([
    s1x_interp(np.linspace(0, 1, ns2)),
    s1y_interp(np.linspace(0, 1, ns2))])
```

In [9]:

```
s3 = s1_new + s2
pt.plot(s3[0], s3[1])
```

Out[9]:

```
[<matplotlib.lines.Line2D at 0x1066d2490>]
```



In [ ]: