Lab 10 Notes

April 15, 2024

1 What is Scipy?

Library that lets us do a little more advanced math: linear algebra, integration, diffeq, ect.

1.1 Different Functions

- fsolve can solve a function for its zero values

```python
[12]: from scipy.optimize import fsolve
      import numpy as np

      def f(x): return np.sin(x)**10
      print(fsolve(np.sin, 1)[0])
      print(fsolve(f, 1)[0])

      def g(x): return (x*(1+x**3))-1 #Should have 4 roots
      print(fsolve(g, 1)[0])
      print(fsolve(g, -1)[0])

      def h(x): return 1/(x-1)
      print(fsolve(h, 2, full_output=True)[0])
```

```
0.0
1.8836348276318992e-13
0.7244919590005156
-1.2207440846057642
[1.76023683e+83]
```

- We can also solve systems of equations using Scipy using an application of Linear Algebra

```python
[16]: import numpy as np
      from scipy.linalg import solve

      A = np.array([[3, 2, -1],[2, -2, 4],[-1, 1/2, -1]])
      B = np.array([1, -2, 0])
      x = np.round(solve(A, B),3)

      print(f"x = {x[0]}, y = {x[1]}, z = {x[2]}")
```

```
x = 1.0, y = -2.0, z = -2.0
```

- We can also perform integrals using Scipy

```python
import numpy as np
from scipy.integrate import quad

def f(x): return x**2

print(quad(f, 0, 4)[0])

def g(x): return np.exp(-x**2)

print(quad(g, 0, np.inf)[0])
```

```
21.333333333333336
0.8862269254527579
```

[ ]: