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MATH 240

Lab 7

Exercise 1:
The functions are in the lib.py

- Test for Newtons:
  - x1**2 + x1*x2 - 16, x2*exp(x1) + sin(x2) - 4
  - Solutions: 3.96286537, 0.07461723
  - Iterations: 10
- Testing Gradient Descent:
  - x1**3 + x1*x2 + (x2 + 1)**2
  - Solutions: 0.66666664, -1.33333328
  - Iterations: 91

Exercise 2:

- I was able to find 4 solutions for {x1**2 + x2**2 - 4, x1**2 - x2**2 - 1}
  - Solutions: [-1.58113883 1.22474487]
  - Iterations: 4
  - Solutions: [-1.58113883 -1.22474487]
  - Iterations: 4
  - Solutions: [1.58113883 1.22474487]
  - Iterations: 4
  - Solutions: [1.58113883 -1.22474487]
  - Iterations: 4

Exercise 3

- I was able to find 4 solutions for {x1**2 + x1*x2**3 - 9, 3*x1**2*x2 - x2**3 - 4}
    - Solutions: [-3.00162489 0.14810799]
    - Iterations: 3

    - Solutions: [-0.90126619 -2.08658759]
    - Iterations: 3

    - Solutions: [1.33635538 1.7542352]
    - Iterations: 4

    - Solutions: [2.99836535 0.14843098]
    - Iterations: 3

Exercise 4:

- I was able to find 2 solutions for {5*x1*x2 - x1*(x2 + 1), -x1*x2 - 4*x2 - 4}
    - Solutions: [4.53176792e-10 -1.00000000e+00]
    - Iterations: 6

    - Solutions: [-20.   0.25]
    - Iterations: 6

Exercise 5:

- I was able to find 2 solutions for {5*x1*x2 - x1*(x2 + 1), -x1*x2 - 4*x2 - 4}
    - Solutions: [4.53176792e-10 -1.00000000e+00]
    - Iterations: 6

    - Solutions: [-20.   0.25]
    - Iterations: 6

Exercise 6:

- I was able to find 1 solution that didn't converge for {5*x1*x2 - x1*(x2 + 1), -x1*x2 - 4*x2 - 4}
    - Solutions: [1.03290046 1.06701243]
    - Iterations: 200

Exercise 7:

- I was able to find 1 solution that didn't converge {sin(0.5*x1**2 - 0.25*x2**2 + 3)*cos(2*x1 - exp(x2) + 1)}
    - Solutions: [1.91058158 1.73634801]
    - Iterations: 500