

HW3

May 9, 2023

STAT 207 HW3

Due May 19th

Your Name

All homeworks should be completed independently; make your answers and codes as concise as possible; avoid excessive outputs; submit BOTH your source code and output file to Canvas.

Please refer to the textbook for full statements of the problems.

1. NAS Problem 11.7.1

Which of the following functions is coercive on its domain? Give convincing reasons in each case.

...

2. NAS Problem 11.7.6

Find all of the stationary points of the function ...

3. NAS Problem 11.7.12

Minimize the function $f(x) = e^{-(x_1+x_2)}$ subject to the constraints $h_1(x) = e^{x_1} + e^{x_2} - 20 \leq 0$ and $h_2(x) = -x_1 \leq 0$ on \mathbb{R}^2 .

4. NAS Problem 12.12.15 & 16

Solve the multivariate t-distribution with two update approaches.

Then implement both update schemes with the following setting and compare the convergence iterations.

```
[5]: import numpy as np
from scipy.stats import multivariate_t

# Define parameters
m = 100 ## number of samples
mu = np.array([0, 1, 2])
Sigma = np.array([[2, 1, 0.5],
                  [1, 2, 1],
```

```

[0.5, 1, 2]])

# Generate samples from multivariate t-distribution
t_dist = multivariate_t(mu, Sigma, df = 5)

samples = t_dist.rvs(size =m)

print(samples.shape)  # prints (100, 3)

```

(100, 3)

5. NAS Problem 12.12.11

Consider the function

$$f(x) = \frac{1}{4}x^4 - \frac{1}{2}x^2.$$

...

6. NAS Problem 13.10.8

Program the EM updates (13.5) for the ABO allele frequency data ...

[]: