# CS57800: Statistical Machine Learning

## Homework 0

Due: Aug 29, 2018 on Wednesday

## 1 Mathematical Foundations

### 1.1

$x_2 + x_3 = 1$

### 1.2

(1, 1, 0)

### 1.3

#### 1.3.1

$f' = \frac{21}{2}x^{3/2}$

#### 1.3.2

$f' = (e^{2x} + e)^{-\frac{1}{2}}e^{2x}$

#### 1.3.3

$f' = 3\log^2(5x^2 + 9)\frac{10x}{5x^2+9}$

### 1.4

#### 1.4.1

$\frac{\partial f}{\partial x} = y^3 + 2xy^2$

$\frac{\partial f}{\partial y} = 3xy^2 + 2x^2y$

#### 1.4.2

$\frac{\partial f}{\partial x} = e^{2x+3y} + 2xe^{2x+3y}$

$\frac{\partial f}{\partial y} = 3xe^{2x+3y}$

### 1.5

$10^8 \prec log^4\sqrt{n} \prec 2^{log_2 n} \prec 2^{3log_2 n} \prec n^{\frac{3}{2}} log^2 n \prec 2^n \prec (\frac{5}{3})^{2n}$

### 1.6

#### 1.6.1

10.5

#### 1.6.2

42.875

#### 1.6.3

8.75

## 2 Report of Python Programming

Firstly, we read data into our two data structures: $nodeVal$, which stores the value of each node, and $nodeEdge$, which stores the edge between the edge. After that, we use a queue-based BFS(recursive BFS is unreasonable so I ignore it) to traverse the graph and find the node with smallest value, which is node 3297 with value 3. The total time running on server upon the given dataset is 0.41s(average of 3 executions).