Problem Set #[2]
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1 Problem 1

1.1 part (a)

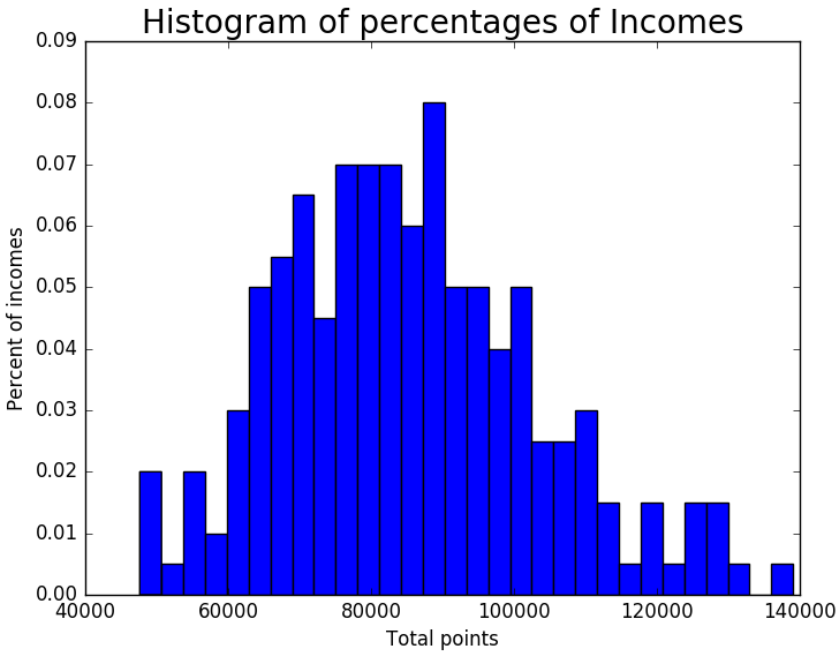

Figure 1: Histogram of percentages of Incomes

1.2 part (b)

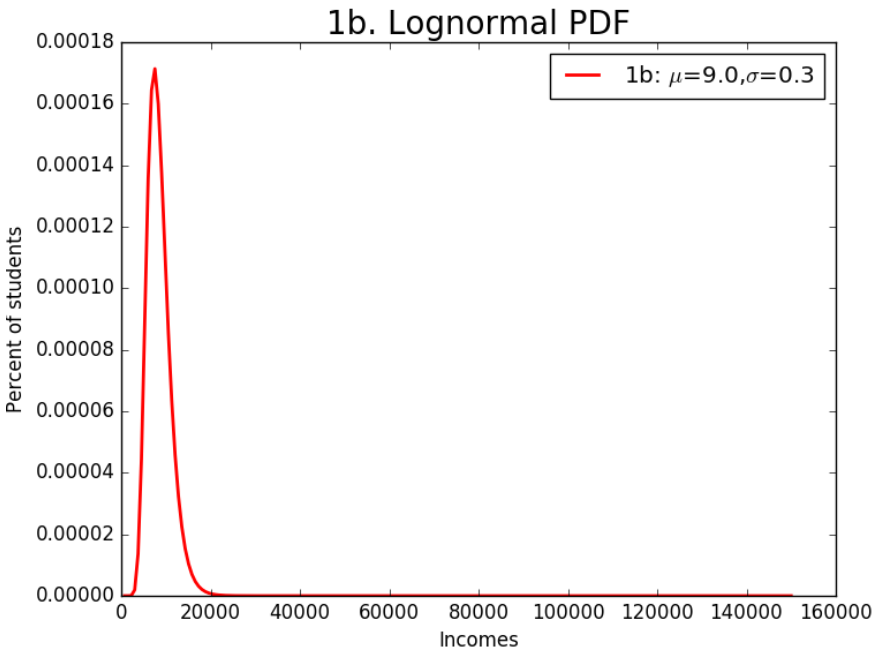

Figure 2: Lognormal PDF

The value of the log likelihood value for this parameterization of the distribution and given this data is -8298.63695601.

1.3 part (c)

The ML estimate for μ is 11.3314399475.
The ML estimate for σ is 0.211674520247.
The value of the likelihood function is -2239.534744.
The variance-covariance matrix is

$$\begin{bmatrix} 2.39790422 \cdot 10^{-4} & 3.51933125 \cdot 10^{-6} \\ 3.51933125 \cdot 10^{-6} & 1.12461584 \cdot 10^{-4} \end{bmatrix}$$

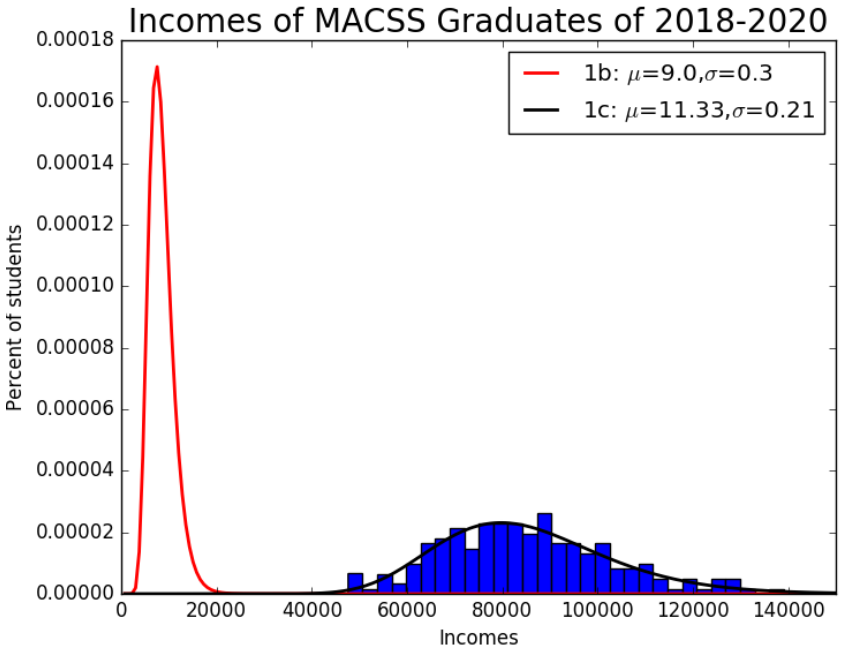

Figure 3: Incomes of MACSS Graduates of 2018-2020

1.4 part (d)

The probability that the data in incomes.txt came from the distribution in part (b) is 0.

1.5 part (e)

The probability that I will earn more than 100,000 is 0.195765351485. The probability that I will earn less than 75,000 is 0.307689146853.

2 Problem 2

2.1 part (a)

β_0 : 0.251646223703
β_1 : 0.0129333477226
β_2 : 0.400502027975
β_3 : -0.00999166717682
σ^2: $9.10648570176 * 10^{-6}$
$Log - likelihood$: 876.865047494

The variance-covariance matrix is

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

2.2 part (b)

The likelihood that age, number of children, and average winter temperature have no effect on the number of sick days is 0.