

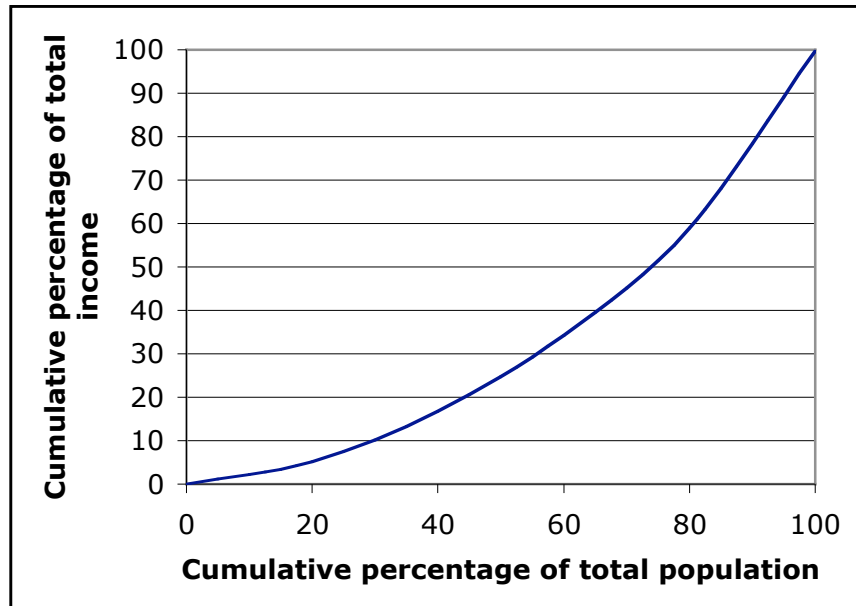
Solutions for Recitation Handout 3

1. The completed table for the United States is given below.

Population group	Percentage of total income of country earned by this group	Cumulative percentage of total population	Cumulative percentage of total income
20% of population with lowest incomes	5.2	20	5.2
20% of population with second-lowest incomes	11.6	40	16.8
20% of population with incomes in the middle of the range	17.5	60	34.3
20% of population with second-highest incomes	24.1	80	58.4
20% of population with highest incomes	41.3	100	99.7

Table 1: Income distribution for the United States, 1978.

Using these points to plot a graph (with cumulative percentage of total population as the independent variable and cumulative percentage of total income as the dependent variable) gives the graph shown below.



2. **Hungary:** The Lorenz curve climbs quite steadily, rather than being low for most of the time and then suddenly jerking up at the end. This suggests that instead of having most of the income in the hands of a few people, income is quite evenly distributed among people in Hungary.

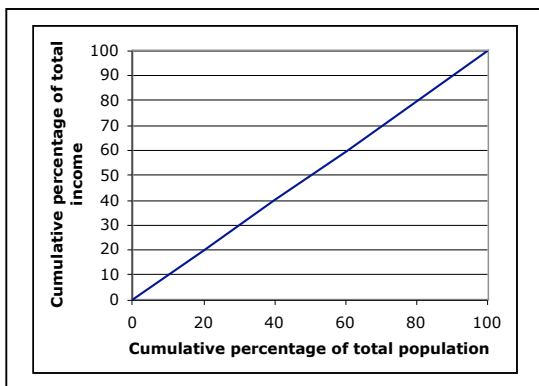
Brazil: In contrast to Hungary, Brazil's Lorenz curve stays quite low until it gets to 80% of the total population. This indicates that the lowest-paid 80% of the Brazilian population make very little money, whereas the top 20% of income-earners make a lot. Therefore, in Brazil, the income is not very equally distributed throughout the population at all.

Of the two countries, the shapes of the Lorenz curves suggest that in Hungary the income is distributed the most evenly. The feature of Hungary's Lorenz curve that suggests this evenness in the distribution of income is that the y -values of the Lorenz curve increase almost as quickly as the x -values increase. So, each percentage of the population will be collecting roughly the same percentage of the total national income. On the personal level, this means that there are no huge disparities between individuals' incomes.

In Brazil there appears to be a substantial inequality of income between wealthy and poor. The feature of Brazil's Lorenz curve that suggests that this is the case is the fact that the curve remains low, hardly rising at all, and then suddenly shoots up at the end. The low, non-rising portion of the graph means that the vast majority of income-earners (80% of the population) make very little money as collectively they only account for a small fraction (about 30%) of all the income paid in Brazil. On the other hand, the top 20% of income earners account for about 70% of all the income paid in Brazil. This means that each individual person who is in the top 20% of income earners will (on average) receive about 10 times as much income as a person in the lower 80% of income-earners. This concentration of income in the hands of the top 20% of income earners causes the Lorenz curve to suddenly shoot up at the end.

3. Extrapolating these observations to the very extreme economic scenarios described on the homework will therefore produce the following Lorenz curves.

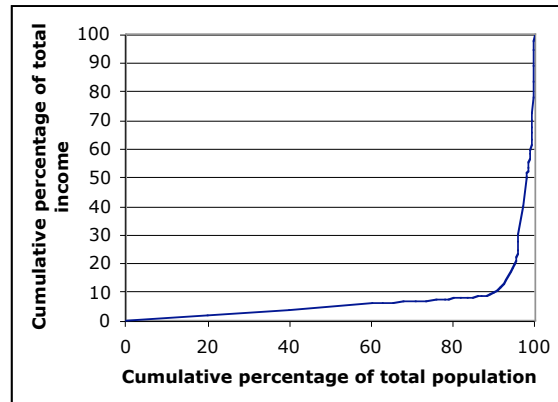
- An economic system in which income is almost equal for everyone.



In this situation, y should increase at exactly the same rate as x increases, as everyone receives almost exactly the same income. The Lorenz curve should be a straight line that connects the points at $(0, 0)$ and $(100, 100)$.

- An economic system in which almost all income is concentrated in the hands of a few people and the vast majority of people have very low incomes

In this situation, the graph should stay low and hardly rise until right at the end when it will suddenly shoot up to the point (100, 100).



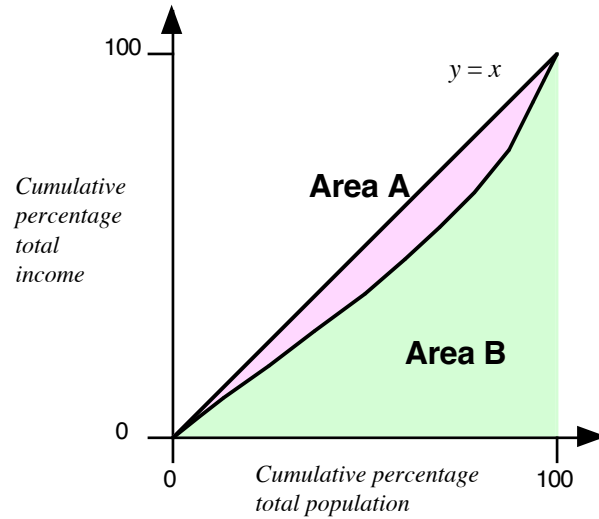
4. **Brazil:** Measuring the areas of *A* and *B* using Figure 4 on the handout gives that Area *A* is approximately 2900 and Area *B* is about 2100. Therefore, the Gini Index for Brazil is approximately

$$\text{Gini Index} = \frac{\text{Area A}}{\text{Area A} + \text{Area B}} = \frac{2900}{2900 + 2100} = 0.58$$

Hungary: Measuring the areas of *A* and *B* using Figure 5 on the handout gives that Area *A* is approximately 1200 and Area *B* is about 3800. Therefore, the Gini Index for Hungary is approximately

$$\text{Gini Index} = \frac{\text{Area A}}{\text{Area A} + \text{Area B}} = \frac{1200}{1200 + 3800} = 0.24$$

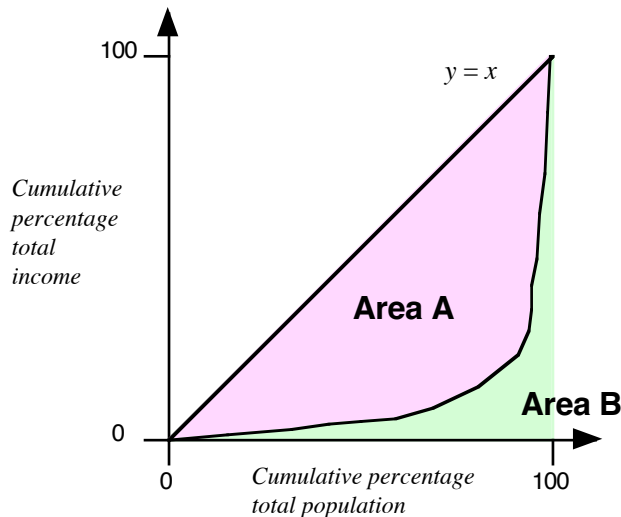
5. **In an economic system in which income is distributed very evenly,** the Gini Index will be close to zero. The reason for this is shown in the diagram below.



When the Lorenz curve closely resembles the line $y = x$, the area A that is between them is very close to zero. Therefore the Gini Index will be very close to zero.

$$\text{Gini Index} = \frac{\text{Area A}}{\text{Area A} + \text{Area B}} = \frac{(\text{Quantity very close to zero})}{(\text{Quantity very close to zero}) + \text{Area B}} \approx 0$$

In an economic system in which income is concentrated in the hands of only a few individuals, the Gini Index will be close to one. The reason for this is shown in the diagram below.



When the Lorenz curve is low most of the time and suddenly shoots up to (100, 100) at the very end, the area A that is between the Lorenz curve and the line $y = x$ (Area A) is very close to the entire area under the line $y = x$. This means that the

area B will be very close to zero. Therefore the Gini Index will be very close to one.

$$\text{Gini Index} = \frac{\text{Area A}}{\text{Area A} + \text{Area B}} = \frac{\text{Area A}}{\text{Area A} + (\text{Quantity very close to zero})} \approx 1$$

6. When the Gini Index is increasing, the rate of change will be positive and the graph showing rate of change will be above the horizontal axis. On the other hand, when the Gini Index is decreasing the rate of change will be negative and the graph showing the rate of change will be below the horizontal axis of the graph.
7. According to the graph showing the rate of change of the Gini Index, the rate of change was positive for the entire year of 1999. Therefore, Professor Paulos' report (filed on August 1, 1999) that the gap between rich and poor (as measured by the Gini Index) was increasing appears to have been accurate.
8. The largest rate of change in the Gini Index shown by the graph is 0.02. This occurred at the end of 1992 or possibly the start of 1993. At the time, George H. W. Bush was the President of the United States.
9. The longest period of time during which the Gini Index stayed positive was from 1981 to 1989. During this time period, Ronald Reagan was the President of the United States.
10. The year is 2006. This is the year when the amount of area above the horizontal axis minus the amount of area below the horizontal axis is the highest. The President of the United States in 2006 was George W. Bush.
11. It is true that the gap between rich and poor reached its highest levels ever during the presidency of George W. Bush. However, former President Bush cannot be credit with either the largest rate of change in the Gini Index (this happened while his father was President) nor the longest period of increase in the Gini Index (which was the Regan presidency). If you look at the graph from 2001 onwards, there are definite ups and downs that do not look very different from the ups and downs that occurred during the Clinton administration. Therefore, although there is no evidence to suggest that former President Bush did anything to reduce the gap between rich and poor, it seems unfair of Democratic politicians to accuse his policies of having widened the gap at either a faster rate or greater magnitude than his predecessors.