AP Calculus BC - Ahlborn *Name*_____

Laboratory Assignment - 8 *Name*_____

*Date turned in*_____

Gini Index

The distribution of income in our society is a concept of ongoing interest to economists, politicians, and public policy analysts. The data that economists use to quantify distribution of income is often presented in the form of a table similar to that on page 3. It gives the percent of total income of the United States earned by each fifth of the population ordered by income. The data in the table means that, beginning in 1935, the lowest fifth of all households earned 4.1% of all personal income for that year. The second fifth earned 9.2%, and so on. The highest fifth earned 51.7% of all personal income.

A graph of the data is obtained by plotting the *cumulative* percent distribution of aggregate income versus the proportion of the population measured from the least income, as we did in class. This graph is called the Lorenz Curve. The Lorenz curve indicates the total income which is received by the bottom x proportion of the population. The Egalitarian Line is the Lorenz curve for perfect equality, where every worker has the same income.

A reasonable model for the Lorenz Curve is a power function, since the curve must always pass through (0, 0) and (1, 1). We will fit a curve of the form $y = x^m$ to the data. Since $\ln y = m \ln x$ or $m = \dfrac{\ln y}{\ln x}$, we will find m by averaging the ratios $\dfrac{\ln y}{\ln x}$ for all points, excluding (0, 0) and (1, 1). (More sophisticated methods of obtaining the Lorenz curve are used in actual income studies, but this simple method is sufficiently accurate for our purposes.)

Economists have developed a standard index of inequality of income distribution called the Gini Index. The Gini Index corresponds to twice the area between the Lorenz Curve and the Egalitarian Line.

1. Load the StudyWorks template from the file C-LAB-8.MCD. *(My Computer Public Access Ahlborn Ahlborn-CalculusBC C-LAB-8.MCD)*

2. Using the attached template as a guide, type in the needed information.

NOTE: You, *personally*, do not have to do the calculations described below for every year of data given in the table. You may divide up everyone in the class, assign years, and share results. However, you are responsible for the accuracy of all data you report.

3. For each year of data given:

   a. Convert the income data to *cumulative* income data.

   b. Type in the cumulative income data (see page 3 of these instructions) for a given year under Inc_i. Press F9 to display a graph of the data.

   c. Use StudyWorks to find the Lorenz Curve $y = x^m$ that fits the data and to display the graph.

d. Use StudyWorks to calculate the Gini Index and to display a graph of the Lorenz curve together with the Egalitarian Line.

e. Enter the year and the value of the Gini Index on the worksheet under $Year_j$ and $Gini_j$, respectively.

f. Print out a copy of the worksheet for *two* of the years that you personally calculated.

4. Print out a copy of the final results when you have entered and graphed the Gini Index for all of the given years.

5. Study the final graph of the Gini Index for the years 1929 through 2008. What trends are noticeable from the results? What events have occurred in the past 80 years to cause changes in the Gini Index? How has the Gini Index been influenced by policies of the federal government? How useful do you think the Gini Index is in illustrating the effects of public policy decisions?

6. Prepare a written report which includes each of the following:

a. This assignment paper as a cover to the report. Please fill in your name(s) and the due date. If you had a partner but are turning in separate reports, put the partner's name in parentheses.

b. An introductory paragraph about the nature and purpose of the assignment.

c. A summary of your results, interpretations, and conclusions.

d. An essay dealing with the questions posed in part 5. above.

e. All requested print-outs.

Percent Distribution of Aggregate Income

Year	Lowest Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
1929	0.03	12.47	13.8	19.3	54.4
1935	4.1	9.2	14.1	20.9	51.7
1941	4.1	9.5	15.3	22.3	48.8
1946	5.0	11.1	16.0	21.8	46.1
1950	4.8	10.9	16.1	22.1	46.1
1955	4.8	11.3	16.4	22.3	45.2
1960	4.6	10.9	16.4	22.7	45.4
1964	4.2	10.6	16.4	23.2	45.5
1967	4.0	10.8	17.3	24.2	43.8
1968	4.2	11.1	17.5	24.4	42.8
1970	4.1	10.8	17.4	24.5	43.3
1972	4.1	10.5	17.1	24.5	43.9
1974	4.4	10.6	17.1	24.7	43.1
1976	4.4	10.4	17.1	24.8	43.3
1978	4.3	10.3	16.9	24.8	43.7
1980	4.3	10.3	16.9	24.9	43.7
1981	4.2	10.2	16.8	25.0	43.8
1982	4.1	10.1	16.6	24.7	44.5
1984	4.1	9.9	16.4	24.7	44.9
1985	4.0	9.7	16.3	24.6	45.3
1986	3.9	9.7	16.2	24.5	45.7
1988	3.8	9.6	16.0	24.3	46.3

1989	3.8	9.5	15.8	24.0	46.8
1990	3.9	9.6	15.9	24.0	46.6
1992	3.8	9.4	15.8	24.2	46.9
1993	3.6	9.0	15.1	23.5	48.9
1995	3.7	9.1	15.2	23.3	48.7
1996	3.7	9.0	15.1	23.3	49.0
1998	3.6	9.0	15.0	23.2	49.2
2000	3.6	8.9	14.8	23.0	49.8
2001	3.5	8.7	14.6	23.0	50.1
2002	3.4	8.8	14.9	23.2	49.6
2003	3.4	8.8	14.7	23.3	49.8
2004	3.4	8.7	14.8	23.0	50.1
2005	3.4	8.6	14.6	23.0	50.4
2006	3.4	8.6	14.5	22.9	50.5
2007	3.4	8.7	14.8	23.4	49.7
2008	3.4	8.6	14.7	23.3	50.0

Data is taken from the following two sources from the U.S. Bureau of the Census.

1. Current Population Reports, series p60-p184. *Money Income of Households, Families, and Persons in the United States: 1992*, U.S. Government Printing Office, Washington, D.C., 1993.
2. *Money Income in the United States: 1999* (p60-209), Table C, www.census.gov/hhes/www/income99.html
3. *Income, Poverty, and Health Insurance Coverage in the United States: 2008* (P60-236RV), Table A-3. www.census.gov/hhes/www/income/income.html