1) Suppose Jane spends all of her earnings on food (denoted by C) for her family. The cost of working more for Jane is spending less time with her family. Let W denote the hours worked per year for Jane and L represent the leisure hours she spends with her family. Jane can work a maximum of 2000 hours per year and assume that she spends all of her remaining time from work with her family (W + L = 2000). Assume further that Jane can initially make $20/hour (after-taxes) and food costs $1/unit. Jane also receives $10,000 annually as part of a government welfare program regardless of the amount she works.

a. Write down the initial budget constraint for Jane in terms of L and C. What is the price of an hour of leisure for Jane? Draw the budget constraint indicating the x-intercept (L), y-intercept (C) and the slope.

b. Now assume that the government is planning to introduce a tax-cut program for all workers. There are two alternatives under which the final wage-rate of Jane increases to:
   i. Alternative-1: $25/hour
   ii. Alternative-2: $40/hour

What is the price of leisure for Jane under these two alternative policies? Draw the budget constraints for these two alternatives as well as for the initial case ($20 wage rate) on the same graph.

c. What do you predict the impact of the tax-cut will be on Jane’s food consumption (C) and her leisure time spent with her family (L)? Identify the income and substitution effects separately, and then predict the total effect of the policy change on C and L.

d. Assume that Jane’s utility function takes the following form:

\[ U(C,L) = 50\ln(L) + 50\ln(C) \]

Set up the utility maximization problem and solve for Jane’s optimum consumption of food (C), leisure (L) and hours worked (W) under

   i. Initial: $20/hour
   ii. Alternative-1: $25/hour
   iii. Alternative-2: $40/hour

Tabulate your results as follows:
<table>
<thead>
<tr>
<th>Wage Rate</th>
<th>$20/hour</th>
<th>$25/hour</th>
<th>$40/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e. Consider another individual (let’s call him David), who is identical to Jane except his utility function which is in the following form:

\[ U(C,L) = 150\ln(L) + 50\ln(C) \]

Repeat part (d) with this utility function.

f. Assume that the economy consists of Jane and David. Find the aggregate labor supply (in hours/year) in the economy under the three scenarios (initial, first alternative and the second alternative). Tabulate your results as follows:

<table>
<thead>
<tr>
<th>Wage Rate</th>
<th>$20/hour</th>
<th>$25/hour</th>
<th>$40/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Labor Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

g. Find the wage (price) elasticity of labor supply in the economy. In other words, find the elasticity when the initial wage is $20/hour and the final wage is $25/hour.

2) Suppose that we are trying to find the returns to education in the labor market. In other words, our primary interest is to estimate the impact of an additional year of schooling on the wage rate of the individual. For this purpose, we conduct a survey in 1987 among workers asking them about their years of schooling (educ) and wage rates (wage). The data is available at [http://plaza.ufl.edu/umutozek/teaching_files/ECO4504.htm](http://plaza.ufl.edu/umutozek/teaching_files/ECO4504.htm) under Assignment-1.

a. First, look at the dataset in Sheet1 where the survey results for the entire sample are provided. The first column gives the reported hourly wage rates for the workers whereas the second column provides their years of schooling. Make a scatter-plot of the two variables where the y-axis is the wage rate and the x-axis is the years of schooling. What kind of a relationship can you see between wage rates and years of schooling in this graph?

b. Given that you are all good economists aware that a simple scatter-plot can not provide a formal answer to the question of interest, you decide to conduct a regression analysis. Formally, you are trying to estimate the following model using ordinary least squares:
\[ y_i = \beta_0 + \beta_1 X_i + \epsilon_i \]

where \( i \) denotes the workers, \( y_i \) denotes the wage rate for worker \( i \), \( \beta_0 \) is the constant term, \( X_i \) is the years of schooling for worker \( i \), \( \beta_1 \) is the returns to schooling (parameter of interest) and \( \epsilon_i \) is the error term.

In order to perform regression analysis in Excel, you need to follow these steps:

i. Go to ‘Tools’ and check whether ‘Data Analysis’ is already installed. Otherwise, go to ‘Tools’ and then ‘Add-Ins’, click the tab next to ‘Analysis ToolPak’ and click ‘OK’ to install the data analysis toolbox.

ii. After installing (if not already installed), go to Tools and then ‘Data Analysis’. Choose ‘Regression’.

iii. Choose the entire wage column (except the first row) as the Y range and the entire second column (except the first row) as the X range. Make sure that ‘New Worksheet Ply’ is selected in the ‘Output Options’ and click ‘OK’. The regression results will be given in a separate sheet.

In the new sheet where the regression results are provided, the estimate of \( \beta_1 \) is given under ‘Coefficients’ right next to the ‘X variable’. Does the sign of \( \beta_1 \) confirm your prediction about the relationship between wage rate and years of schooling? What is the impact of an additional year of schooling on the wage rate of the workers? In other words, how much does an extra year of schooling increase/decrease the wage rate?

c. Having obtained these results, you thought that the returns to schooling might be different for different professions. For this purpose, you created two sub-samples. Sheet2 provides the data for the construction workers in the dataset. Repeat the same analysis in (b) using this dataset and answer the same questions. Does the estimate of \( \beta_1 \) you obtained for the entire sample in (b) overestimate or underestimate the impact of schooling for the construction workers?

d. Sheet3 provides the data for the workers in finance in the dataset. Repeat the same analysis in (b) using this dataset and answer the same questions. Does the estimate of \( \beta_1 \) you obtained for the entire sample in (b) overestimate or underestimate the impact of schooling for the finance workers?

e. Can you think of a cause for concern in this analysis? In other words, is there a reason to think that there might be another factor causing both higher years of schooling and higher wage rates, which would lead to biased estimates? If so, what is the other factor? (there is no unique answer to this question)