1. In the country of Wonderland, the income tax rate is 20%. In addition, parents can claim a tax credit of €5,000 for each of their children. A tax credit means that if a worker has 1 child, his total tax bill will be reduced by exactly €5,000.

   Alice is a single mother who works 2,000 hours per year at a gross wage rate of €10 per hour. She also has 2 daughters.

   Now a politician proposes a tax reform: the income tax rate will be cut to 10%, and at the same time the tax credit will be decreased to €2,500 for each child.

   (a) In a graph with leisure on the horizontal axis and consumption on the vertical axis, draw Alice's budget constraint before and after the proposed tax reform. Make sure to show Alice's consumption bundle before the tax reform, and to label everything (wage rate, non-labor income, etc.) carefully. **(20 points)**

(b) What will happen to Alice's labor supply as a consequence of the tax reform? Explain using your graph. **(14 points)**

2. A firm produces and sells fruit on the market at €10 per kg. The firm faces a positively sloped labor supply like

$$E = 20w - 120$$

where E is the number of workers hired each hour and w is the hourly wage rate (and the firm cannot discriminate among workers). Assume there are no other costs of production besides labor. The firm's production function is $q = 3E - 0.05E^2$, where q is expressed in kg.

a) What is the marginal cost for the firm? **(7 points)**

b) How many workers should the firm employ in order to maximize profits? **(7 points)**

c) What is the salary paid to workers? **(5 points)**

d) What would be the employment level and the wage paid to workers if the firm's production function was $q = 2E$ instead? **(5 points)**

e) Under this new production function, assume that a government introduces a minimum wage in the food industry of €6.50. What is the new employment level? **(5 points)**

f) And what if the minimum wage was set to €8.00? **(5 points)**

3. A researcher finds that earnings of college graduates are positively correlated with Grade Point Average (GPA) in college.

   Economist A: "These results are not surprising. Students with higher GPA have learned more material in school, and therefore are more productive workers. This is consistent with human capital theory."

   Economist B: "I don't think this is the explanation for the finding. The positive correlation is just due to signaling."

   a) Explain Economist B's claim. **(8 points)**

   b) Assume that some students work in occupations that are highly compatible with their major field of study in college (e.g., journalist majors work as journalists, drama majors are involved in theater production, etc.), while others work in incompatible occupations (English majors as economic consultants). If the human capital theory (Economist A's theory) is correct, would you expect to observe a stronger correlation between earnings and GPA for workers in compatible or incompatible occupations? **(8 points)**

c) Assume that some students attend selective colleges, while others attend less selective colleges. If the signaling theory (Economist B's theory) is correct, would you expect to observe a stronger correlation between earnings and GPA for workers that attended more selective or less selective colleges? **(8 points)**

d) Assume that you have data for a sample of recent college graduates, on log earnings, a student's GPA in college, an index of compatibility between the student's major and his occupation, and a measure of the selectivity of the college. Write down a regression equation that would allow you test the theories of Economists A and B. Be specific about the hypotheses to be tested, and how you would implement the test. **(10 points)**

4. Think of the paper by Krueger, A. and S. Pischke (1992): "The Effect of Social Security on Labor Supply: A Cohort Analysis of the Notch Generation."

   (a) Summarize the paper (research idea, data, empirical approach, findings, interpretation). **(20 points)**

(b) According to the paper, what could be the effect on retirement age at one and at two years from a reform that increases the generosity of pension benefits, while at the same time increasing the minimum retirement age by one year? Explain **(14 points)**