1. The objective of this problem is to understand the incentive effects (and potential costs) of alternative welfare initiatives on a representative member of the working poor. Assume that the individual currently works 8 hours at the minimum wage of $6 per hour and would not pay taxes even if he or she worked 24 hours per day. The State of North Carolina is considering either increasing the minimum wage or offering a negative income tax plan (NIT).
   a. Draw the budget constraint for this individual on a standard labor-leisure diagram, show the current equilibrium and indicate the MRS of leisure for income.
   b. Consider a minimum wage plan that would increase the wage to $7. Illustrate this plan on a diagram, and show the income and substitution effects for the individual assuming that leisure is a normal good.
   c. Now consider a specific NIT that would offer the beneficiary a basic allowance of $36 per day with a tax of 50% on any earnings. Show the effect of this plan on the budget constraint and calculate the break-even point.
   d. Show the range of possible responses to the NIT plan in terms of hours worked for the representative member of the working poor (there are 3 possibilities).
   e. The State Department of Health & Human Services has contracted Professor B. Devil of the Duke School of Public Policy to calculate the cost of this program to the state. The professor predicts that the representative individual’s salary will be increased by $12 per day if he or she works 8 hours per day, and the daily cost to the State will be $12 million based on 1 million eligible beneficiaries. Is this a good estimate of the individual daily subsidy? What is the range of possible costs to the State?
   f. A clever Duke student sends an email to the State Secretary of HHS explaining that the 50% NIT is a powerful incentive for beneficiaries to reduce work hours, and recommending that the tax back rate be reduced to 25%. Explain why reducing the tax back rate does not unambiguously increase hours worked for program beneficiaries.

2. Consider the imposition of a $1 payroll tax per unit of labor. Explain what happens to the equilibrium wage and quantity demanded of labor, and the incidence of the tax, under the following conditions:
   a. A regular upward sloping supply curve for labor.
   b. A perfectly elastic supply curve.
   c. A perfectly inelastic supply curve.

3. Question 4.2 on page 120 of Friedman is similar to Q1 and can be done for practice.

4. Ruby has preferences over leisure (L) and income (M) according to \( U = L^{2/3}M^{1/3} \) and is endowed with \( T \) units of time. The wage rate is \( w \) and her labor supply is given by \( H = T - L \).
   a. Set up her maximization problem and derive the full income constraint.
   b. Assuming \( T=24 \) derive the optimal amount of leisure demand (or labor supply) for Ruby. Does your solution seem realistic?
   c. Now assume that Ruby’s preferences are given by \( U = 48L + LM - L^2 \). Derive her optimal labor supply. How does it vary with the wage?
5. Maya consumes two goods, X and Z with prices $p_i (i=X, Z)$ respectively. In addition she receives unearned income of $A$ and has an endowment of $Z$. 

a. Write down Maya’s utility maximization problem and present and interpret the FOC.
b. Write down the general form of the solution to this problem—the reduced form ordinary demand functions for Z and X.
c. Using your knowledge about the theory of endowment goods, write down the Slutsky equation for Z, and explain each of its components. [Hint: You should be able to identify the term $(\bar{Z} - Z)$ somewhere in this equation.

i. Compare Maya’s demand curve for Z in the case when she is a net seller of Z and when she is a net buyer of Z. When does she appear to be more responsive to a price change in Z? Explain the intuition behind your answer.