1. Define the following concepts:
   (a). Behavioral relationships, identities and equilibrium conditions
   (b). Stock, flow and ratio variables
   (c). Endogenous variables and exogenous variables

2. Consider the following simple labor market supply and demand model:

\[
\begin{align*}
L_d &= 200 - P + 0.1N \\
L_s &= -50 + 4P - 0.5R
\end{align*}
\]

where \( L_d \) is quantity demanded per month, \( L_s \) is quantity supplied per month, \( P \) is the wage rate, \( N \) is population and \( R \) is the price of inputs that substitute for labor.

(a). In this model, which variables are exogenous and which endogenous, what are the behavioral relationships, which are stock flow and ratio variables, and what is the equilibrium condition?

(b). Show exactly what will happen (i.e, what are the numbers) to prices and equilibrium output levels when \( R \) increases from 50 to 70 and, at the same time, \( N \) increases from 1000 to 1200.

(c). What happens when \( R \) increases from 50 to 70 and \( N \) falls from 1000 to 800?

(d). What happens when \( R \) decreases from 50 to 40 and \( N \) increases from 1000 to 1200

3. Define the following national income accounts concepts (review of chapter 2):

Real GDP, real GNP, nominal GDP, nominal GNP, inflation, a Laspeyres price index, a Paasche price index, consumption, investment, private saving, public saving, total saving, exports, imports, net exports, national income, depreciation, fixed investment, transfer payments, government expenditures taxes.

Also define the following money supply concepts: M1, M2 and M3.

4. Define the following labor market concepts: the population, the labor force, the civilian labor force, unemployment, the unemployment rate, and discouraged workers.

5. Why is the GDP of a country such as the United States not a measure of economic welfare?

6. Explain the difference between GDP and GNP.

7. Are the following national income accounting relationships identities, equilibrium conditions, or behavioral relationships? Give reasons for your answer.

\[
Y = C + S + T \quad \text{and} \quad Y = C + I + G + NX.
\]
8. Show that the Cobb-Douglas production function \( Y = A K^\alpha L^{1-\alpha} \) exhibits constant returns to scale. Also show that if markets are competitive, the marginal product of capital (\( MP_K \)) associated with this production function can be written as \( MP_K = \alpha (Y/K) \).

9. Consider the following aggregate (economy wide) production function:

\[
Y = 10K^{0.3} L^{0.7}
\]

Assume throughout this question that the economy consists of perfectly competitive, profit maximizing firms.

(a) Show that this production function exhibits constant returns to scale.

(b) Explain the economic concept of constant returns to scale.

(c) Assume that the economy is endowed with 20 units of capital (\( K=20 \)) and derive numerically the marginal product of labor function for \( L \) equal to zero through 15 units of labor.

(d) Plot the marginal product of labor function.

(e) If the price of output (\( P \)) is $50 and the money wage (\( W \)) is $250, what are the profit maximizing levels of employment and output in the economy. Also, assuming the economy is in a long run equilibrium, show the fraction of total output earned by labor and the fraction of total output earned by capital.

(f) Explain why, in the long run, firms make zero economic profits in this economy.

(g) Now assume that labor supply is perfectly inelastic and that the quantity of labor available in the economy is 20 units (\( L=20 \)) while \( K \) still equals 20. Show the equilibrium real wage and distribution of income between labor and capital in this economy.

(h) Now redo the above question under the assumption that the labor supply falls by 20 percent because of a sudden outburst of bubonic plague. Describe what has happened to the real wage, capital's income share (and price) and labor's income share as a result of the plague. Was the plague truly an ill wind that blew nobody any good?

(i) Now redo question (g) under the assumption that the capital stock has increased by fifty percent because of an influx of foreign capital.

(j) Now redo question (g) under the assumption that technology improves and the constant term in the production function, \( A \), increases by 20 percent from 10 to 12.