Q1-Suppose in 2006, the CPI equals 100. That year, John borrows a nominal value of $1,000 from the bank. Suppose the expected rate of inflation is 3%. Both parties agree the loan will be repaid in one year along with a real interest rate of 2%.

a. What is the CPI in 2007, the year in which the loan is repaid— if expectations are realized?

b. What is the nominal payment John must make to the bank in 2007?

c. What is the real payment John must make to the bank in 2007 (take 2006 as the base year)?

d. Suppose actual inflation in 2007 unexpectedly realized 7%. What is the nominal payment that John should make to the bank in 2007 if the inflation were known to be 7%?

e. Who, if anyone, benefits from the unexpected inflation?

f. What would be the macroeconomic effects of such unexpected inflation? Is this socially costly? If so, why?

Q2-Consider the long-run classical theory studied in Chapter 3. Suppose that the production technology in the economy is given by the functional form: 

\[ Y = K^{0.5}L^{0.5} = \sqrt{KL}. \]

Long-run capital in the economy is fixed at \( K = 100 \) and labor is fixed at \( L = 25 \). The consumption in the economy follows the following functional form:

\[ C = 10 + 0.75(Y - T) \]

where \( T \) is the lump-sum tax in the economy, given by \( T = 10 \). Further, government expenditure is given by \( G = 5 \), and investment demand function is given by \( I = 10 - 100r \) where \( r \) is the real interest rate.

a. Determine which of \( K, L, Y, C, I, G, T \) and \( r \) are exogenous and which of them are endogenous.
b. What is the level of total output in this economy?
c. What is the level of consumption, investment and real interest rate?
d. What is the value of private saving, public saving and total saving?

**Q3**- Assume an economy has a production function: \( Y = A F (K, L) \), where \( A \) is productivity, \( K \) is capital, \( L \) is labor. The consumption function of the economy is given by \( C = MPC(Y - T) \), where \( Y \) is the output, \( T \) is tax and \( 0 < MPC < 1 \). Also assume this is a close economy, which means the demand of the economy is composed by consumption, investment, and government spending: \( Y = C + I + G \), where investment is a function of interest rate: \( I = I(r) \). What is the effect of an increase in \( A \) on equilibrium amount of saving, investment, and interest rate? Use graphs to show your results.

**Q4**- Consider a Cobb-Douglas production function with three inputs. \( K \) is capital (the number of machines), \( L \) is labor (the number of workers), and \( H \) is human capital (the number of college degrees among the workers). The production function is \( Y = K^{1/3}L^{1/3}H^{1/3} \)

a. Derive an expression for the marginal product of labor. How does an increase in the amount of human capital affect the marginal product of labor?
b. Derive an expression for the marginal product of human capital. How does an increase in the amount of human capital affect the marginal product of human capital?
c. What is the income share paid to labor? What is the income share paid to human capital? In the national income accounts of this economy, what share of total income do you think workers would appear to receive? (Hints: consider where the return to human capital shows up.)

**Q5**- In a country, the velocity of money is constant. Real GDP grows by 5 percent per year, the money stock grows by 14 percent per year, and the nominal interest rate is 11 percent. What is the real interest rate?
Q6-Suppose that the money demand function takes the form \( (M/P)^d = L(Y, i) = Y/5i \).

a. If output grows at rate \( g \), at what rate will the demand for real money balances grow (assuming constant nominal interest rate)? (The real money balances is \( (M/P)^d \))

b. What is the velocity of money in this economy?

c. If inflation and nominal interest rate are constant, if any, will velocity grow?

d. How will a permanent increase in the level of interest rate affect the level of velocity? How will it affect the subsequent growth rate of velocity?

Q7-The steady-state rate of unemployment is \( U/L = s/(s + f) \). Suppose that the unemployment rate does not begin at this level. Show that unemployment will evolve over time and reach this steady state.

Q8-The quantity theory of money (Fisher 1911) asserts that money demand is proportional to nominal income, i.e. \( M^d = k PY \), with \( k \) constant.

a. What is the velocity of circulation of money according to this specification?

b. Modern theory of money demand considers the nominal interest rate as a further determinant of money demand. Specifically: \( M^d = PL(Y; i) \), with \( L \) increasing in \( Y \) and decreasing in \( i \). Give intuition for why \( L \) decreases with \( i \).

c. Consider the further assumption \( L(Y; i) = Y(I) \), with \( I \) decreasing in \( i \): Is money demand still proportional to nominal income, as in the original quantity theory?

d. Obtain an expression for velocity in this new specification. How would you expect velocity to change with an increase in \( i \)? Provide economic intuition for this effect. How does this result differ from the original quantity theory?

Q9- Explain what happens to consumption, investment, and the interest rate when the government increases taxes.