1. (25 pts) The information below describes the current state of a growing closed economy.

   - Production function: \( Y_t = K_t^\alpha (Q_t N_t)^{1-\alpha} \)
   - Production per effective worker \( y_t = k_t^\alpha \)
   - Growth rate of technology \( g_Q \)
   - Growth rate of workers \( n \)
   - Depreciation rate \( d \)
   - Saving rate \( s \)

   a) Write and explain the equation which determines the long-run equilibrium value of capital per effective worker.

   b) Use a diagram of equilibrium in the Solow model to show how an increase in the savings rate affects the equilibrium value of capital per effective worker, \( k \).

   c) What is the rate of growth of output per effective worker and of output per worker in the long run? How does the increase in the savings rate \( s \) affect these rates of growth? Explain. How does an increase in the savings rate affect these rates of growth in the long run? Explain.

   d) Now set \( \alpha = 1 \) and redraw the Solow diagram with \( K \) on the horizontal axis. Use the diagram to show how an increase in the savings rate affects the rate of growth of capital and output. Pick an initial capital stock and label it \( K_0 \). Use the graph to explain how \( K \) changes over time.
2. (25 pts) a) What is the yield to maturity on a 2 year discount bond with a face value of $100, when the interest rate in the first year is 2.00%, the interest rate in the second year is expected to be 3.00%.

b) Assume that short-term interest rates are currently near zero (as they are). Graph the yield curve, relating returns on the one year bond with returns (yield to maturity) on bonds with greater maturity. Returns should be on the vertical axis and maturity on the horizontal. Is the slope positive or negative? Give two reasons.

c) Write an expression for the price of a particular stock using present-value. Define any symbols you use in the expression.

d) Use your expression above to explain how a decrease in the expected value of future productivity (A in the production function), which reduces the firm’s expected future profits, would affect the price of stocks.
3. Assume that all prices and wages are perfectly flexible, so that the economy is characterized by the Classical model. Use the graphs requested in each problem to illustrate the effect of the shocks below. Carefully label axes, curves (both initial and shifted), and initial and final equilibrium values for variables. **Explain** carefully why curves shift.

a) Government spending falls today and is expected to rise again in the future such that taxes do not change. (10 points)
b) There is a reduction in productivity (A falls but $A^e$ is constant.) (15 points)
4. Assume that prices are sticky in the short-run, but flexible in the long run as in a Keynesian model. Use the graphs requested below to analyze the effects of the following shocks in the short-run when prices are fixed. Carefully label axes, curves (both initial and shifted), and equilibrium values for variables. **Explain** why curves shift.

a) Household wealth rises (12 points).
b) The Fed reduces the money supply. (13 points)