For the data questions, any source is fine. Experiment and note that some sources are better than others in the way the data is presented. Check some of the suggested sites on the class web page. An excellent all around source is the Economic Report of the President. Document the source on your homework.

For some of the exercises, I strongly recommend that you use a spreadsheet (such as Excel) or similar type of program. If you have not used a spreadsheet program, now is the time. In this day and age (hey, it is the third millennium!) knowing how to use a spreadsheet is de rigueur so time to get with it.

1. Express the growth rate of \( y \) in terms of the growth rates of \( k, l, m \) for the following cases. Assume \( \beta \) is an arbitrary constant.
   (a) \( y = k^\beta \).
   (b) \( y = k / m \).
   (c) \( y = (klm)^\beta \).
   (d) \( y = (k_1 l_1 m_1)^\beta (1/m)^{1-\beta} \).

2. Suppose \( x_t = x_{t-1}(1 + g_t) \) for \( t = 1, 2, \ldots \). Show that \( x_t = x_0 (1 + g)^t \).

3. Do Question 5 in Chapter 2 of Mankiw.

4. What was nominal GDP and GNP in 1998? What is the difference between these two measures of income?

5. What was the federal deficit and debt in 1990 and 1998? Calculate these as a fraction of GDP and compare. What do you see?

6. Define the labor force participation rate. Compare this rate for both sexes over the 1980’s – what do you see?

7. The question asks you to compare GDP over the 1980’s and 1990’s. For each decade use yearly observations of GDP to do the following:
   a. Transform all values by taking logs – then calculate the average annual growth rate of GDP over each decade.
   b. Construct a trend series for GDP for each decade – this can be done directly from Excel if you know how (follow the steps in the Help section) or simply calculate the trend as:
      \[ y_{T,t} = y_{T,t-1} + \bar{g} \]
      where \( y_{T,t} \) defines the trend at time \( t \) and \( \bar{g} \) is the average growth rate from step (a). For 1980 and 1990, use actual (again, in logs) GDP for the trend.
   c. Construct the cyclical component of GDP using (b) and using the definition:
      \[ y_t = y_{T,t} + y_{c,t} \]. Plot the cyclical series, \( y_{c,t} \) over the two decades. What do you see?
   d. Compute the standard deviation for \( y_{c,t} \) in each decade? Interpret your results.

8. Question 7, Chapter 2 of Mankiw.

9. Question 8, Chapter 2 of Mankiw.

10. Question 2, Chapter 3 appendix (p. 76).

11. What are the three approaches to measuring an economy’s aggregate income?

12. In our discussion of factor incomes, we presented a simple model of a firm’s demand for capital and labor. Within that model, identify the exogenous and endogenous components.
13. Suppose the production function is given by $Y = A \sqrt{KL}$ where $Y$ is GNP, $K$ is capital, and $L$ is labor. Initially, $A$ is equal to 10. If all factors are employed and the supply of capital and labor is 100 and 400 respectively, what is:
   a. GNP?
   b. The total amount of output paid to labor?
   c. The total amount of output paid to capital?
   d. The real wage of labor?
   e. The real rental price of capital?

14. Question 6, Chapter 3 of Mankiw.
15. Question 8, Chapter 3 of Mankiw.