Homework #2 – Due Friday February 2

1. What was the average annual growth rate of per-capita (real) GDP in the U.S. during the 1990’s? (You can calculate this using the data on the Mankiw web site.) How does this compare to the average during the period 1960-90 (this can be found in the Chapter 3 supplemental notes on the class web site)?

2. The Federal Reserve publishes a document called the Beige Book, which provides a wealth of information on current labor conditions and economic conditions in general. The most recent edition can be found at the URL: www.federalreserve.gov/FOMC/BeigeBook/2001
Access this site and, after scanning through the document, provide a paragraph summary of economic conditions in the 12th District (the district that contains California).

3. The following table presents growth rate data for four countries (A, B, C, and D) between 1998 and 2008:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal GDP</td>
<td>30</td>
<td>22</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>Price Level</td>
<td>18</td>
<td>10</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Population</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

   a. Which country has the largest rate of output growth per capita?
   b. Which country has the smallest rate of output growth per capita?

4. a. Country X has a growth rate of 3% and Country Y has a growth rate of 4%. Assume that they both start off with equal incomes. How much richer will Country Y be after 20 years? After 50 years?

   b. Assume that Country H has twice the income per capita of Country K. Country H is growing at 3% and Country K is growing at 4%. Will Country K every catch up? When?

4. One of the “stylized facts of growth” is that the capital/income ratio is roughly constant. Use the Mankiw web site and, using the Data Plotter Transform option, see whether this is indeed true for the US for the years 1970-1998. What is this ratio?

5. Suppose the economy's production function is \( y = k^{\alpha} \) and suppose the depreciation rate (\( \delta \)) is zero. Using the condition associated with investment demand, i.e. \( MPK = r \), prove that the interest rate elasticity of investment demand is positively related to \( \alpha \). (hint: take natural logs). What does this mean?

6. You are hired as a summer intern at the Council of Economic Advisers. Your immediate superior asks you to write a brief outlining what you know about policies for promoting growth. Explain to her in a paragraph why the Solow model has no answer to this question.

7. The economies of A-land and B-land are identical in all respects except that A-land has a higher depreciation rate. In both countries population growth and technological progress are zero. Will A-land or B-land have a higher value of GDP per capita? Why is this so?
8. In the Kingdom of Slovenia, the saving rate is 0.16, the depreciation rate is 0.1, and the share of labor is 50%. Assuming that Slovenia is experiencing zero productivity growth and zero population growth, what is the steady-state capital/labor ratio? (Assume a Cobb-Douglas production function of \( Y = K^\alpha L^{1-\alpha} \).)

9. Suppose that a country's production function is \( Y = K^{0.25} (LE)^{0.75} \).
   a. What is the per-labor efficiency units production function: \( y = f(k) \)?
   b. Suppose that the country possesses 160,000 units of capital and 405,000 units of labor and 2 units of efficiency. Determine the level of output and output per worker.
   c. If the savings rate of the economy is 8% and the economy is growing at 17%, what is the depreciation rate needed to make the current capital-labor efficiency ratio consistent with steady state?
   d. If the economy is currently in a steady state, is it also at the Golden Rule level of capital accumulation? If not, what policies could be pursued to reach the Golden Rule?

10. Within the Solow growth model with population growth and technological change, suppose the production function is: \( y = k^{0.5} \) where \( y \) denotes output per labor efficiency units and \( k \) denotes capital per labor efficiency units. Suppose that a developed country has a saving rate of 28% and a population growth rate of 1% per year; in contrast a less developed country has a saving rate of 10% and a population growth rate of 4% per year. In both countries \( g = 0.02 \), and \( \delta = 0.04 \). Find the steady-state level of \( y \) for each country.

11. Labor productivity is defined as \( \frac{Y}{L} \), the amount of output divided by the amount of labor input. Start with the growth accounting equation and show that:
    \[
    \%\Delta \left( \frac{Y}{L} \right) = \%\Delta A + \alpha \%\Delta \left( \frac{K}{L} \right).
    \]

12. Suppose an economy described by the Solow model is in a steady state with population growth \( n \) of 1.0% per year and technological progress \( g \) of 2% per year. Total output and total capital grow at 3% per year. Suppose further that the capital share of output is 0.3. If you used the growth accounting equation to divide output growth into three sources – capital, labor, and total factor productivity – how much would you attribute to each factor. Compare your results to the figures given in Table 5-3 of Mankiw.