1. If two countries have the same saving rate, the same population growth and the same technology, then a Solow model predicts that both countries converge to the same steady state and attain the same GDP per capita in the long run. Explain economic (intuitive) reason behind this prediction.

2. Answer the following questions.

   (a) Kaldor found 6 robust facts for the long run behavior of aggregate data. What are the Kaldor's Stylized facts?

   (b) Show how the neoclassical growth model in the steady state explains the Kaldor's Stylized Facts.

   (c) Describe 5 development facts stated by Parente and Prescott (1993) and Durlauf and Quah (1998).

3. Consider the following production function

$$Y_t = A_t K_t^{\alpha} \left(N_t\right)^{1-\alpha}$$

   where Y_t is GDP, K_t is capital stock, N_t is the number of population and A_t is Solow residual at date t. Assume that a firm maximizes its profit and every market is competitive. Assume that we can obtain data about Y_t, K_t, N_t. I also assume that it is possible to obtain data about the rental price of capital and the wage rate.

   (a) Show how g_A can be estimated?

   (b) Suppose that it is difficult to estimate the rental price of capital. Can you still estimate g_A? Show your estimation strategy.

4. Suppose that Japan and the US has the same production function

$$Y_t = K_t^{\alpha} \left(T_t N_t\right)^{(1-\alpha)}$$

   where Y_t is output, K_t is capital stock, T_t is the labor augmenting technology and N_t is the number of workers. Assume that the growth rate of technology, g, and the depreciation rate, δ, and the growth rate of the number of workers, n, in Japan are the same as those in the US. Assume that $\alpha = \frac{1}{3}$.

   (a) Derive the steady state value of GDP per workers as a function of the saving rate, s, the growth rate of technology, g, the depreciation rate, δ and the the growth rate of the number of workers, n, and the current level of technology, T_t.

   (b) Suppose that Japan has 2 times larger saving rate than US and they have the same current level of technology. How much does income per capita differ on the steady state?

(c) Assume that Japan and the US have the same saving rate, but the current level of technology in the US is 1.5 times larger than that in Japan. How much does income per capita differ on the steady state?

(d) A developed country has a saving rate of 30 percent and a population growth rate of 2 percent per year. Suppose that a developing country has a saving rate of 10 percent and a population growth rate of 5 percent. Suppose that initial technology of the developed country is 10 times higher than that of the developing country and that both country has the same productivity growth and depreciation rate: $g = 0.02$ and $\delta = 0.03$. Assume that $\alpha = \frac{1}{3}$. How much is GDP per capita in the developed country larger than that in the developing country in the steady state?

(e) Derive a regression equation that shows $\log \frac{Y}{L}$ as a functions of $\log s$ and $\log (n + g + \delta + ng)$.