ECON2113 Macroeconomics

Chapter 4 Exercises

1. Consider a two-sector model of growth, with two kinds of investment opportunities – one with a diminishing marginal product and one with a constant marginal product. (*Hint*: See the figure on P16 of lecture notes.)
    a. What does the production function for this problem look like?
    b. Characterize the set of equilibria for this model. Does output in any of the equilibria have nonzero per capita growth?
    c. What can this model help us explain that strict endogenous and neoclassical growth model cannot?

2. Now suppose we have a one-sector model with a variable rate of population growth. (*Hint*: See the figure on P19 of lecture notes.)
    a. What does the investment requirement line look like for this model?
    b. Characterize the set of equilibria, being sure to discuss their stability or lack thereof. Does output in any of these equilibria have nonzero per capita growth?
    c. Suppose a country is in a "poverty trap" – at the equilibrium with the very low level of output per person. What could the country do to move toward a point with higher income?

3. Suppose you add a variable rate of population growth to a two-sector model of growth. (*Hint*: Combine the above two figures.)
    a. What do the production function, investment requirement line, and saving line look like?
    b. Characterize the set of equilibria for this model. Does output in any of the equilibria have nonzero per capita growth?
    c. Does the addition of the variable rate of population growth to this model help you explain anything that a simpler two-sector model with a fixed rate of growth, or a one-sector model with variable population growth, cannot?

4. Consider an economy whose production function is $Y = K^{\theta}(AN)^{1-\theta}$, with $A = 4K/N$. Suppose that it has a saving rate of 0.1, a population growth rate of .02, and an average depreciation rate of .03 and that $\theta = .5$.

a. Reduce the production function to the form $y = ak$. What is a?
b. What are the growth rates of output and capital in this model?
c. Interpret a. What are we really saying when we assume that the labor-augmenting technology, A, is proportional to the level of capital per worker?
d. What makes this an endogenous growth model?