ECO2134 Macroeconomic Theory II
Midterm #1
Instructor: Alex Armstrong
July 3, 2013
Time Allotted: 1 hour 20 minutes

Student's Name:
Student ID:

Part 1: MULTIPLE CHOICE QUESTIONS (4 marks each)
Read all answers carefully and choose the best answer by circling the letter beside it.

1. Which of the following is generally false?

   (a) Instead of using the market exchange rate, the use of an exchange rate adjusted for purchasing power parity to compare income levels tends to make poor countries look better.

   (b) Instead of using the market exchange rate, the use of an exchange rate adjusted for purchasing power parity to compare income levels tends to make rich countries look even richer.*

   (c) The use of an exchange rate adjusted for purchasing power parity accounts for the fact that non-tradable goods and services are cheaper in poorer countries.

   (d) The market exchange rate tends to be determined by the law of one price for internationally tradeable goods.

2. The Golden Rule level of capital stock maximizes:

   (a) steady-state income per capita.

   (b) income per capita growth.

   (c) steady-state consumption per capita.*

   (d) total investment.

3. Suppose there are two countries that are identical with the following exception: the investment rate in country A is greater than the investment rate in country B. Given this information, in the *long run*, the Solow model informs us that:

   (a) the capital stock per worker will be the same in both countries.

   (b) the growth rate of output per capita will be the same in both countries.*

   (c) the growth rate of output per capita will be greater in B than in A.

   (d) the growth rate of output per capita will be greater in A than in B.

4. Between 1950 and 1980, the rate of growth of output per capita was highest in which of the following countries?

   (a) Canada

   (b) The United Kingdom

   (c) The United States

   (d) Japan*

5. Freedonia's GDP per capita was $14,000 20 years ago and $15,000 10 years ago. If it's GDP per capita has been growing at a constant rate for each of the last twenty years, what is Freedonia's per capita GDP this year (to the nearest dollar)?

   (a) $21,064
   (b) $17,035
   (c) $16,071*
   (d) $17,944

6. Which of the following is *not* a proximate factor in explaining income per capita differences between countries:

   (a) Technology
   (b) Capital accumulation
   (c) Culture*
   (d) Production efficiency

7. Which of the following statements is the most accurate?

   (a) In much of the developing world, the rise in mortality rates has outpaced the decline in fertility rates over the past 60 years.
   (b) In much of the developing world, the decline in mortality rates has outpaced the decline in fertility rates over the past 60 years.*
   (c) In much of the developing world, the rise in fertility rates has outpaced the rise in mortality rates over the past 60 years.
   (d) In much of the developing world, the decline in fertility rates has outpaced the decline in mortality rates over the past 60 years.

8. Let $y = k^{1/2}$, where y is output per worker and k is capital per worker. Let $\gamma = .25$ be the investment rate, $\delta = .05$ be the depreciation rate and $n = .0125$ be the population growth rate. According to the Solow model, the steady-state capital stock per worker is:

   (a) 16*
   (b) 8
   (c) 4
   (d) 2

9. The return to education for each of the first four years of school is 13.4% and for each of the following four years of school is 10.1%. If someone with no education earns a wage of $1, how much can he or she expect to be paid after attending six years of schooling (to the nearest cent)?

   (a) $2.00*
   (b) $1.28
   (c) $1.82
   (d) $2.34

10. Which characteristic do physical and human capital *not* share?

    (a) Produced.
    (b) Earn a return.
    (c) Embodied in the individual.*
    (d) Productive.

PART 2: PROBLEMS (60 marks)
In the booklet provided answer the following questions.

11. **Malthusian Model**: Consider the following Malthusian model. Suppose that the relationship between income per capita ($y = \frac{Y}{L}$) and the growth rate of the population ($\widehat{L}$) is given by the equation:

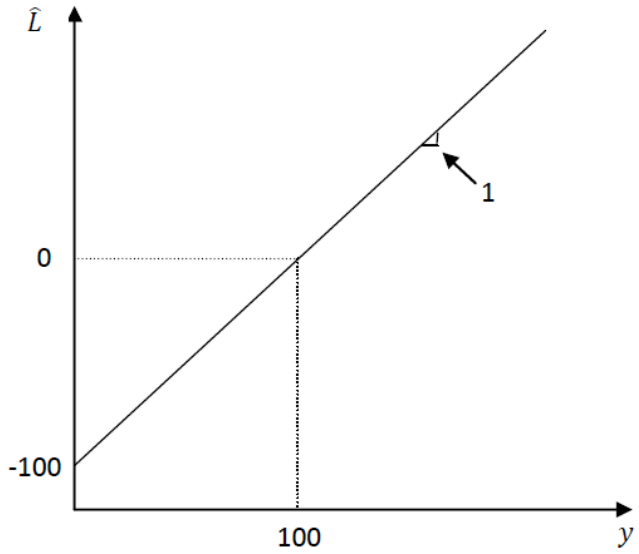
$$\widehat{L} = y - 100$$

and suppose that total output (Y) is produced using labour (L) and land (X), according to the equation:

$$Y = A\left(XL - L^2\right)$$

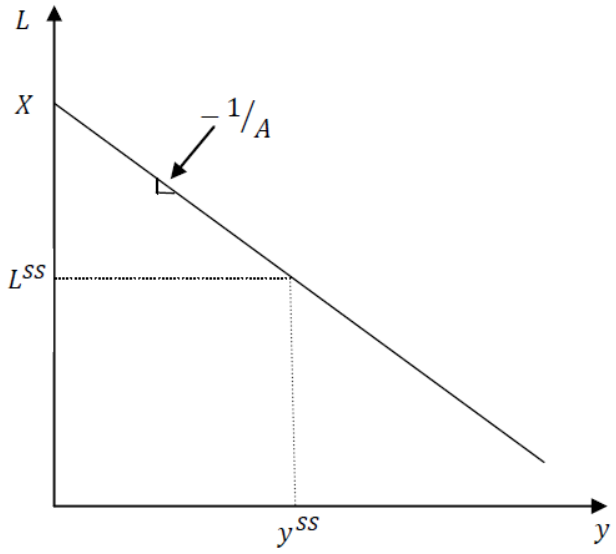
where the factor A denotes productivity.

(a) Draw a graph with y on the horizontal axis and $\widehat{L}$ on the vertical axis showing the relationship between income per capita and population growth. (**10 marks**)



(b) Derive the relationship between population L and income per capita, y. Sketch this relationship on a graph with L on the vertical axis and y on the horizontal axis. (**10 marks**)

$$\frac{Y}{L} = \frac{A\left(XL - L^2\right)}{L} \rightarrow y = A\left(X - L\right)$$



(c) Assume that $X = 200$ and $A = 1$. Then use the equations you have derived to compute the steady-state values of L and y. (**20 marks**)
In the steady-state, $\widehat{L} = 0$ so:

$$y^{SS} = 100$$

and:

$$y^{SS} = 1 \times \left(200 - L^{SS}\right) \rightarrow L^{SS} = 100$$

(d) Now suppose that an advance in technology increases the value of the productivity factor A to $A = 2$. Calculate the new steady-state values of L and y. (**5 marks**)
Now:

$$y^{SS} = 2 \times \left(200 - L^{SS}\right) \rightarrow L^{SS} = 150$$

(e) Explain in words what the model implies about the relationship between productivity improvements, population growth and income per capita. Discuss how these implications agree or disagree with the historical record. (**15 marks**)

- While productivity improvements may have the immediate effect of improving per capita incomes, in the long run this benefit is negated by the relationship between population growth and income.
- Higher productivity increases income per capita which increases population growth which decreases income per capita
- In the end, people are no better off, there are just more of them
- Prior to 200 years ago, this was an accurate description of the facts:
  - people lived at close to subsistence levels regardless of technology
  - roughly equivalent standards of living in: Rome 1st. century, Arabia 10th century, China 11th century, India 17th century, Europe 18th century
- The predictions of the model do not apply today:
  - very large growth in standards of living of past 200 years
  - also the rich countries have the lowest growth rates