Econ 1560 First Midterm Exam

Instructions: Please answer all questions in the blue books. You may not use notes, books, or calculators. Please show your work. There are a total of five questions, for 100 points. Questions vary in their level of difficulty. Partial credit will be given for partially correct answers. Good luck!

1) [5 points] What was the total fertility rate in Japan in 2013? You will get full credit if your answer is within 0.2 of the correct answer, and no credit otherwise.

2) [25 points] County \( i \) and country \( j \) are both described by the Solow model with Cobb-Douglas production functions. Both are in steady state. In both countries, the depreciation rate is 5% and population growth is zero. In country \( i \) the rate of investment is 20%, while in country \( j \) the rate of investment is 10%. Output per worker is four times as high in country \( i \) as in country \( j \).

   The two countries have the same production functions (that is, the same values of \( A \) and \( \alpha \)). Solve for the value of \( \alpha \). Show your work.

3) [25 points] In a certain country, there is never any immigration or emigration. Exactly 1,000 children are born every year. This has been the number of births per year for hundreds of years.

   In this country, the age-specific fertility function \( F(i) \) has not changed for hundreds of years, and neither has the age-specific survival function \( \pi(i) \). Further, exactly half of all births are girls, and the survival functions for males and females are identical.

   A) [12 points] Life expectancy at birth in this country is 70 years. What is the country’s population? Explain how you got your answer.

   B) [13 points] It is observed in this country that in the year 2014, there were exactly 500 people aged 10 and also exactly 500 people aged 55. You should assume that no one gives birth before age 10 or after age 55. What is the total fertility rate? Explain how you got your answer.
4) [25 points] The population growth rate in a country is given by the equation

\[ \dot{L} = -0.01 + \frac{y}{1000} \]

where \( y \) is income per capita.

The production function in the country is

\[ Y = L^{2/3} X^{1/3} \]

Where \( Y \) is total output, \( X \) is the total quantity of land, and \( L \) is the population. Assume that \( X=1,000,000 \).

Solve for the steady state size of the population. Show your work.

5) [20 points] It is observed that people who believe in God have higher fertility than non-believers, and similarly that the TFR in a country is positively correlated with the average level of religiosity.

Two economists are discussing these facts, and tossing around both possible explanations for the observed correlation and ways to test these explanations. For each of the cases below, discuss the specific explanation for the correlation that the economist has in mind and how the results of the test would be interpreted as supporting or not supporting that explanation. You should be concrete in specifying how particular findings in the data would be interpreted.

A) [10 points] One economist suggests doing a randomized controlled trial in a developing country in which the experimenter varies how much education different individuals get, and then measures their fertility and religiosity several years later.

B) [10 points] The other economist suggests doing a long-term follow up survey of individuals who have had near-death experiences, such as being on an airplane that landed after the engines had failed. These individuals would be asked about their fertility and religiosity and compared to a population of people who had not had such near-death experiences.