Instructions: Please answer all questions in the blue books. You may not use notes, books, or calculators. Please show your work. There are 12 questions, for a total of 100 points. Questions vary in their level of difficulty. I have tried to put harder questions at the end. Partial credit will be given for partially correct answers. Good luck!

1) [7 points] An economist has collected data on the gini coefficients for pre-tax income and post-tax income for a large number of countries. She constructs a measure called the “gini gap” as follows:

\[
gini \ gap = gini \ for \ pre-tax \ income \ – \ gini \ for \ post-tax \ income
\]

She then constructs measure of TFP for each country using the development accounting techniques of Chapter 7. Assuming that differences in the gini gap among countries are due solely to tax policies, what would you predict would be the correlation (that is, positive, negative, or zero) between the gini gap and TFP? Explain in two or three sentences.

2) [6 points] The table below shows the probability that a mother in given part of the income distribution (given by the row) will have a daughter in a given part of the income distribution (given by the column). So, for example, the daughter of a woman with income in the bottom third of the income distribution will herself have a 60% chance of being in the bottom third, a 25% chance of being in the middle third, and a 15% chance of being in the top third.

<table>
<thead>
<tr>
<th>Income group of Mother</th>
<th>Income Group of Daughter</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Bottom third</td>
</tr>
<tr>
<td>Bottom third</td>
<td>.6</td>
</tr>
<tr>
<td>Middle third</td>
<td>.25</td>
</tr>
<tr>
<td>Top third</td>
<td>.15</td>
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Show how you would calculate the probability that the granddaughter (along the maternal line) of a woman in the bottom third of the income distribution will herself be in the top third of the income distribution. You should derive the appropriate expression and explain what it means, but you do not have to actually solve for the exact number.
3) [8 points] Two countries have the same TFRs and the same age-specific mortality schedules. Despite this, the countries have different values for the NRR. Give two possible explanations for how this could be.

4) [4 points] The term ________ refers to a practice in which employers are forced to hire more workers than are required for efficient production.

5) [12 points] Below is list of all of the economic transactions that took place in a country in a particular year

- Joe hired Tom to dig copper on land that Joe owned. Joe paid Tom $50 for five hours’ work, which resulted in one ton of copper.
- Joe then sold the copper on the world market for $100.
- Jane gave Tom a haircut, charging him $50.

A) [4 points] Calculate conventional GDP for this country.

B) [4 points] Calculate green GDP for this country.

C) [4 points] Technological progress allows Tom to dig an equal quantity of copper using only 3 hours labor, for which he earns $30. Explain what you expect to happen to both conventional and green GDP. If you think that you have to make further assumptions, please state them explicitly.

6) [5 points] What is the instantaneous effect of an increase in the price of oil on world oil reserves? By instantaneous, I mean before any changes in oil exploration or usage can be implemented. Explain.

7) [10 points] The US Postal Service (which is an independent agency of the United States Government) has a government-granted monopoly in mail delivery. Which of the reasons for government intervention in the economy, as discussed in Chapter 12, might be reasonably deployed to justify this monopoly? In each case, take a couple of sentences to explain.
8) [8 points] The population of a country is composed of two equally sized groups. There are 100 red people, who each have an income of zero. There are 100 green people who each have an income of one. Calculate the Gini coefficient. Be sure to show your work.

9) [8 points] “Countries with low income generally have poor health. But poor health is not a proximate cause of low income. Rather, a poor health environment is an ultimate cause of low income.”

   Explain what the author means by this statement. Assuming it is correct, what are the most likely causal pathways connecting health and income? What are the implications of this understanding of the world for policies regarding health and its relation to income?

10) [10 points] “The textbook presented data showing that saving rates rise with income. These data were interpreted as showing that rising income inequality will raise the saving rate. However, this inference was misplaced. An increase in inequality, holding the average level of income constant, will raise some people’s saving rates and lower those of others. There is no presumption that average saving rate for the economy will go up.”

   Comment on this statement by constructing a simple numerical example to either flesh it out or contradict it. In a few sentences explain what the example teaches.

11) [12 points] A country is described by the Solow model with production function in per worker terms given by \( y = f(k) \). The production function has the standard properties. Assume that factors are paid their marginal products.

   A) [4 points] Draw a picture with capital per worker on the horizontal axis and output per worker on the vertical axis. Assume that capital per worker is given by \( k_0 \). Indicate the quantity of output per worker. Also indicate graphically on your figure how this income is divided between payments to labor and payments to capital.

   B) [4 points] Now suppose that the country opens up to capital flows from abroad. Following an inflow of foreign capital, the new level of capital per worker in the country is \( k_1 \), which is greater than \( k_0 \). Further assume that no domestic capital flows out of the country. What happens to labor income per worker in the country? What happens to rental income per unit of capital in the country? You should use a diagram to answer this question if appropriate.

   C) [4 points] What happens to income of domestically-owned factors (that is, labor plus domestically-owned capital) in this country immediately following the capital inflow? You will need to use a diagram like the figure from part A to answer this question.
12) [10 points] Consider two countries described by the Solow model with no population growth, technological change, or international capital flows. The two countries have the same values of $A$ (productivity), $\gamma$ (the saving rate), and $\delta$ (the depreciation rate). The production function in both countries is (in per capita terms)

$$y = Ak^\alpha$$

Prior to the year 2000, both countries are in steady state.

In the year 2000, Country 1 doubles its level of productivity, holding the saving rate constant, while Country 2 doubles its saving rate, holding the level of productivity constant.

In the year 2005, how will output per worker compare in the two countries? You should give an answer of the form “the same” or “country 1 will be richer/poorer than country 2 by a factor of xx.” You should not assume that they have reached their new steady states at this point. Write a few sentences and draw an appropriate diagram or equation to show how you are able to compare their levels of output away from steady state.