NANYANG TECHNOLOGICAL UNIVERSITY
SCHOOL OF SOCIAL SCIENCES
SEMESTER 1 AY25-26

HE1002 MACROECONOMICS I

PROBLEM SET 4

4-1

Fill in the blanks in Table 10P-1.

Table 10P-1

Country	Nominal GDP growth (%)	Population growth (%)	Inflation (%)	Real GDP growth per capita (%)
Svea	4	3		−1
Bonifay	3	1	0	
Chaires		2	6	4
Drifton	5	1	−2	
Estiffanulga	7		2	4

4-2

Equation 10-1 states that the Real GDP per capita growth rate = Nominal GDP per capita growth rate – Inflation rate – Population growth rate. This equation is an approximation of the exact rate of growth of GDP per capita, and so it results in some errors when calculating this rate. However, the simplified equation is both easy to use and results in small error terms when inflation, nominal GDP growth, and population growth are low, and so it is a useful approximation. Table 10P-2 lists a fictional country's nominal GDP, real GDP, GDP deflator, and population over two years.

Table 10P-2

Year	Nominal GDP ($)	GDP deflator	Real GDP ($)	Population
2023	1,000,000	1.00	1,000,000	1,000
2024	1,050,000	1.03	1,019,417	1,005

a. Use your knowledge from Chapter 8, "The Cost of Living," to verify that the real GDP figures in Table 10P-2 are accurate.

b. Calculate this country's real GDP per capita for both 2023 and 2024.

c. Calculate the growth rate in this country's real GDP per capita between 2023 and 2024.

d. Calculate the growth rates in the nominal GDP, GDP deflator, and the population.

4-3

For each growth rate below, use the rule of 70 to calculate how long it will take incomes to double.

a. 4 percent.

b. 7 percent.

c. 2.5 percent.

d. 10 percent.

e. 3 percent.

4-4

For each part below, determine whether the following actions will increase or decrease productivity, and name the component of productivity that each affects.

a. The local government builds a new school.

b. Teachers in the new school hold classes for young students.

c. A manufacturer installs robots on its assembly line.

d. A research team designs a more efficient system of irrigation.

e. A soda company discovers a new source of underground water that can be used to make its products.

f. A professor writes a new and improved economics textbook.

g. A large number of people have less access to health care.

h. A worker receives on-the-job training to be a mechanic.

4-5

Which of the countries shown in Table 10P-3 had the highest level of per capita income in 2024? Which had the highest rate of income growth from 2019 to 2024? Do incomes in these countries appear to be converging?

Table 10P-3

Country	GDP per capita 2019 ($)	GDP per capita 2024 ($)
Boliv	3,664	4,592
Chi	4,102	7,519
Ghala	2,007	2,615
Artinia	10,860	15,854
Plazi	8,603	11,239

4-6

In 2021 the median household income in Louisiana was approximately $52,087 per year, while the income per household in Massachusetts was about $89,645. However, suppose the growth rate of per capita real GDP in Louisiana is higher than in Massachusetts (3 percent versus 2 percent).

a. From the perspective of trying to maximize your income per capita, which state will have a higher increase in income in the first year?

b. From the perspective of trying to maximize your income per capita, which state will have a higher increase in 60 years?

4-7

Will the three countries in Table 10P-4 converge to the same level of economic development given enough time?

Table 10P-4

Country	Income per capita ($)	Real per capita GDP growth rate (%)
Ansonia	5,000	7.0
Trumbull	7,500	4.5
Shelton	10,000	2.0

4-8

Indicate whether each of the following statements is true or false and explain your answer.

a. Country A's labor share is 60 percent, Country B's labor share is 70 percent, and labor is growing at a rate of 3 percent in both countries. All else the same, Country B has a higher growth rate of output.

b. Country A's labor share is 40 percent, Country B's labor share is 70 percent, and labor is growing at a rate of 10 percent in country A and 6 percent in country B. All else the same, Country A has a higher growth rate of output.

c. Labor is growing at a negative rate in country A and a positive rate in country B, so country B must have a higher growth rate of output.

d. Labor and capital are both growing more quickly in Country A than in Country B, so Country A must have a higher growth rate of output.

4-9

Calculate the implied growth rate of technology in each scenario in Table 10P-5. Assume labor's share of output is 60 percent and capital's share of output is 40 percent.

Table 10P-5

Scenario	Growth rate of output (%)	Growth rate of labor (%)	Growth rate of capital (%)	Implied growth rate of technology (%)
A	3.0	2	2	
B	4.2	3	3	
C	3.0	1	5	
D	4.2	1	4	

4-10

For each of the following examples, state whether this activity would likely hinder or promote economic growth, and name a component of productivity each produces or reduces.

a. Not requiring students to attend school.

b. Granting patents on new inventions.

c. Building a solid infrastructure system.

d. Allowing local rivers and streams to become polluted.

4-11

Policy-makers in the U.S. government have long tried to write laws that encourage growth in per capita real GDP. These laws typically do one of three things, as listed below. For each of the three points, name a law or government program with that intention.

a. They encourage firms to invest more in research and development in order to boost technology.

b. They encourage individuals to save more in order to boost the physical capital stock.

c. They encourage individuals to invest more in education in order to boost the stock of human capital.

4-12

Name the type of institution that is responsible for promoting a stable environment for the economy regarding each of the following situations.

a. Someone steals your car but is caught.

b. You claim that your employer violated the terms of your employment contract.