

EXAMINATION 3 VERSION A
"Long-Run Economic Growth and Inflation"
April 9, 2026

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators or calculators with alphabetical keyboards are NOT permitted. Cell phones or other wireless devices are NOT permitted. Point values for each question are noted in brackets. Points will be subtracted for illegible writing or incorrect rounding. Maximum total points are 100.

I. Multiple choice: Circle the one best answer to each question. [1 pts each, 16 pts total]

(1) According to the aggregate production function, potential GDP is determined by all of the following except

- a. the size of the labor force.
- b. the size of the capital stock.
- c. business confidence
- d. technology.
- e. None of the above determine potential GDP.

(2) Thomas Malthus believed that in the long run, output per person would

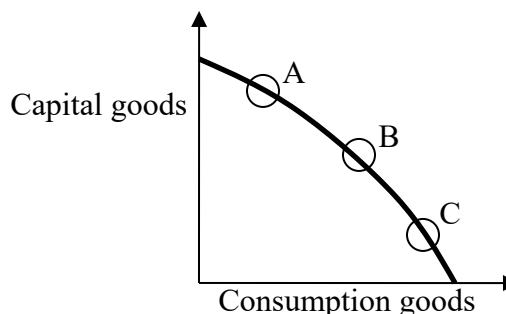
- a. grow at a constant rate indefinitely.
- b. grow at increasing rates indefinitely.
- c. fall to the level of subsistence.
- d. fall at a constant rate indefinitely.

(3) The industrial revolution, which began in Britain, was accompanied by a dramatic increase in

- a. labor input.
- b. land input.
- c. capital input.

(4) Which point on the production possibility curve below results in the *fastest* future economic growth?

- a. Point A.
- b. Point B.
- c. Point C.
- d. All three points result in the same rate of future economic growth because they all lie exactly on the curve.



(5) If the real interest rate rises and nothing else changes, then spending on buildings, equipment, vehicles, computers, networks, and software will

- a. increase.
- b. decrease.
- c. remain unchanged.
- d. cannot be determined from information given.

(6) An increase in U.S. interest rates will cause

- a. the dollar to appreciate against other currencies.
- b. the dollar to depreciate against other currencies.
- c. the exchange rate to remain unchanged.

(7) According to the spending allocation model, which spending component of GDP is *not* related to the interest rate?

- a. Consumption's share.
- b. Investment's share.
- c. Net exports' share.
- d. Government purchases' share.

(8) According to the spending allocation model, an increase in government purchases' share of GDP will cause the interest rate to

- a. rise.
- b. fall.
- c. remain constant.

(9) Unemployment that results from normal turnover of workers and businesses, is called

- a. structural unemployment.
- b. frictional unemployment
- c. cyclical unemployment.
- d. all of the above.

(10) Unemployment caused by a recession is called

- a. structural unemployment.
- b. frictional unemployment
- c. cyclical unemployment.
- d. all of the above.

(11) The so-called "natural rate of unemployment" does not include

- a. cyclical unemployment.
- b. structural unemployment.
- c. frictional unemployment.
- d. unemployment for less than four weeks.
- e. unemployment for more than four weeks.

(12) The theory that unemployment is caused by wages that are above the equilibrium (or market-clearing) level is called

- a. "search."
- b. "Phillips curve."
- c. "job rationing."
- d. "human capital."

(13) "Human capital" means

- a. people-friendly businesses.
- b. ergonomically designed equipment.
- c. education and training.
- d. retirement savings plans.

(14) U.S. states with the highest GDP per capita a hundred years ago have since then

- a. grown more slowly than other states.
- b. grown faster than other states.
- c. grown at the same rate as other states.
- d. stopped growing.

(15) Which kind of money is made from something valuable?

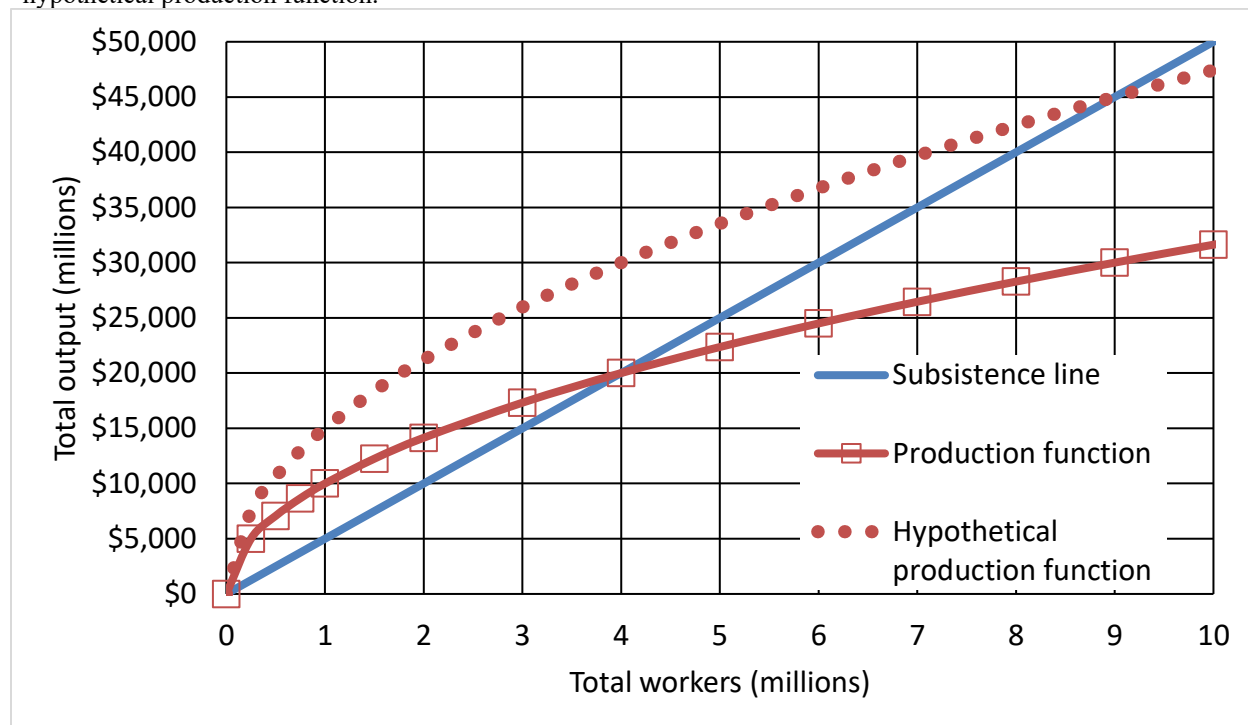
- a. paper currency.
- b. commodity money.
- c. bank deposits.
- d. All of the above.

(16) Hyperinflation is caused by excessive

- a. government spending.
- b. growth of the money supply.
- c. consumption spending.
- d. taxes.
- e. government borrowing.

II. Problems: Insert your answer to each question in the box provided. Use graphs and margins for scratch work. Only the answers in the boxes will be graded. Work carefully: partial credit is not normally given for questions in this section.

(1) [Malthusian model: 18 pts] The graph below shows a Malthusian model of economic growth for a particular economy, where land is fixed and labor (“total workers”) is the only variable input. For the moment, ignore the “hypothetical production function.”



- a. According to this model, how much output is required to sustain each worker? In other words, what is the subsistence level of output per worker?

\$

Suppose the labor force were 6 million.

- b. Would there be *more than enough* food for everyone, *just enough* food, or *not enough* food?
- c. Would the population tend to *increase*, *decrease*, or *remain constant*?

Suppose the labor force were 2 million.

- d. Would there be *more than enough* food for everyone, *just enough* food, or *not enough* food?
- e. Would the population tend to *increase*, *decrease*, or *remain constant*?

- f. What is the *equilibrium* number of workers according to this model?

million

- g. What is the *equilibrium* level of annual wages (output per worker) according to this model?

\$

Suppose the production function shifts up to the hypothetical production function because new land is brought under cultivation.

- h. What will be the eventual new equilibrium number of workers, according to this model?
- i. What will be the eventual new equilibrium level of annual wages (output per worker) according to this model?

million

\$

(2) [Growth of capital stock: 2 pts] The following data (in chained 2017 dollars) were reported by the U.S. Bureau of Economic Analysis.

Net exports in 2023	\$-0.9 trillion
Private capital stock at end of 2022	\$48.5 trillion
Depreciation in 2023	\$3.2 trillion
Government purchases in 2023	\$3.8 trillion
Consumption in 2023	\$13.6 trillion
Gross private investment in 2023	\$3.6 trillion

Compute the private capital stock at the end of 2023. [Hint: Some data are extraneous and not needed for this problem.]

\$ trillion

(3) [Interest rate as opportunity cost: 4 pts] Compute the opportunity cost of consuming \$1000 today, in terms of forgone consumption 5 years from today. In other words, how much consumption 5 years from now is given up when \$1000 is consumed today? Compute your answer to the nearest whole dollar...

a. ... assuming an interest rate of 3 %.

\$

b. ... assuming an interest rate of 5 %

\$

(4) [Interest rate and GDP shares: 10 pts] Suppose the following three equations relate the shares of consumption (C), investment (I), and net exports (X) in total GDP (Y) to the real interest rate (r) in the long run. In these equations, the GDP shares and the interest rate are expressed as percents.

$$(C/Y) = 72\% - 1 r$$

$$(I/Y) = 32\% - 3 r$$

$$(X/Y) = 7\% - 2 r$$

Suppose further that the share of government purchases in GDP (G/Y) is fixed at 19 %. Compute the following. [Hint: Check your answer to be sure that the four GDP *spending* shares sum to 100%.]

a. Interest rate (r)

%

b. Consumption's share of GDP (C/Y):

%

c. Investment's share of GDP (I/Y):

%

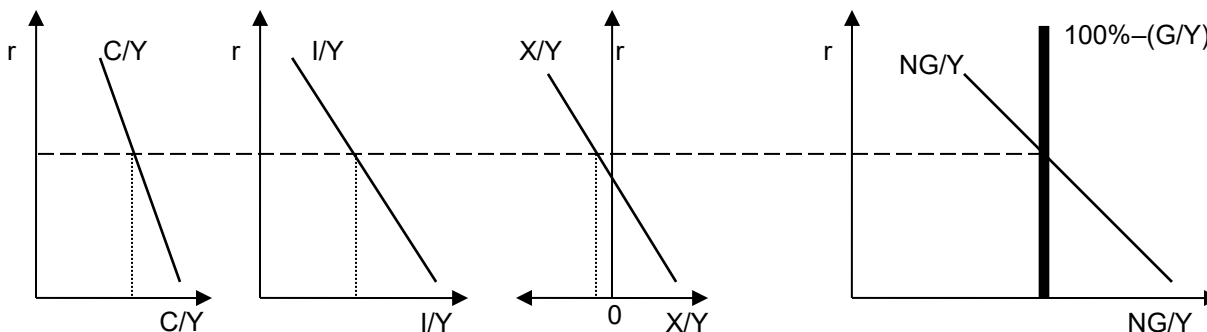
d. Net exports' share of GDP (X/Y):

%

e. Savings as a share of GDP (S/Y):

%

(5) [Interest rate and GDP shares—graph: 18 pts] Consider the following scenario. Suppose the government switches from an income tax to a consumption tax. Use the graphs below of the GDP spending shares model to answer the following questions.



- According to this scenario, which curve shifts: consumption's share (C/Y), investment's share (I/Y), net exports' share (X/Y), or the vertical line representing $100\%-(G/Y)$?
- Does it shift *left* or *right*?
- As a consequence, does the downward-sloping (NG/Y) curve shift *left*, *right*, or remain *unchanged*?
- Does the long-run real interest rate (r) *increase*, *decrease*, or remain *constant*?
- Does the share of consumption spending (C/Y) *increase*, *decrease*, or remain *constant*?
- Does the share of investment spending (I/Y) *increase*, *decrease*, or remain *constant*?
- Does the share of net exports (X/Y) *increase*, *decrease*, or remain *constant*?
- Which spending component—*consumption*, *investment*, *government purchases*, or *net exports*—directly affects potential GDP in the long run?
- Given your answer to (h), in this scenario, will long-run growth *increase*, *decrease*, or remain *constant*?

(6) [Measuring the labor force: 4 pts] Indicate whether each person below would be counted by the U.S. Current Population Survey as *employed*, *unemployed*, or *out of the labor force*.

- A person who is not currently working, but applied for a job last week.
- A person who has a photography business and is thus “self-employed.”
- A retired person who does unpaid volunteer work two days a week for the Red Cross.
- A 17-year-old who works 20 hours per week in her family's restaurant but does not receive a paycheck.

(7) [Measuring the labor force: 8 pts] The U.S. Bureau of Labor Statistics reported the following data for December 2024. [Hint: Some of the data are extraneous and not needed for solving this problem.]

Employed persons working part time for economic reasons	4.4 million
New claims for unemployment insurance	0.4 million
Mean duration of unemployment	23.3 weeks
Not in labor force	101.1 million
Employed	161.6 million
Labor force	168.5 million
Job losers	3.3 million
Discouraged workers	0.5 million

- Compute the number of unemployed people to the nearest tenth of a million.
- Compute the unemployment rate to the nearest tenth of a percentage point.
- Compute the employment-to-population ratio to the nearest tenth of a percentage point.
- Compute the labor force participation rate to the nearest tenth of a percentage point.

million
%
%
%

(8) [Technical change: 4 pts] In India over the period 1965 to 1990, the annual growth rate of output per worker was about 2.4%, and the annual growth rate of capital per worker was about 3.6%. Assume that the share of capital income plus depreciation in national income was about **(1/3)**, as it is in the United States.

- Compute the contribution of capital to productivity growth, to the nearest tenth of a percentage point.
- Compute the contribution of technology to productivity growth, also called the Solow residual, to the nearest tenth of a percentage point.

%
%

(9) [Functions of money: 4 pts] For each sentence below, indicate whether money is functioning as a *medium of exchange*, a *store of value*, or a *unit of account*.

- Most stores accept cash, checks, or debit cards.
- A college savings plan should include a variety of assets including bank accounts.
- You should take money out of the ATM to buy textbooks at the Bookstore.
- Iowa farmland was worth an average of \$9751 per acre in 2021.

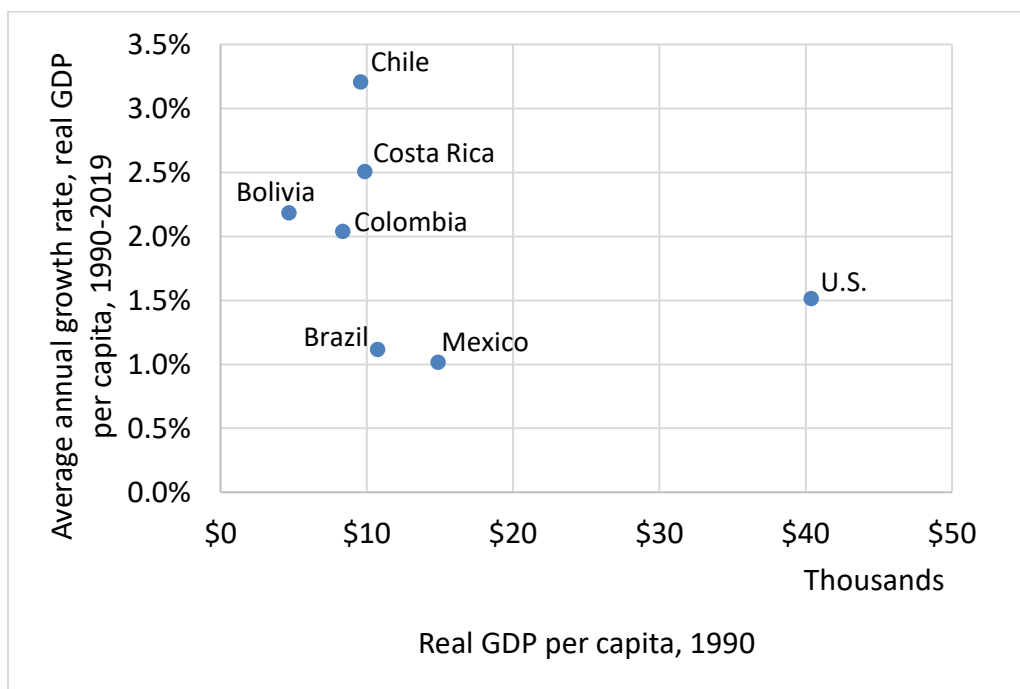
(10) [Quantity equation: 2 pts] Average annual growth rates for various items over the period 1960 to 1990 in the U.S. are reported below. [Hint: Some of the data are extraneous and not needed for this problem.]

Employment	1.6%
M2	7.0%
Consumer credit	7.4%
Real GDP	2.9%
Investment	3.8%

Assuming the velocity of money were constant, what should have been the average annual rate of inflation over this period, according to the quantity equation? Give an answer to the nearest tenth of a percentage point.

%

(11) [GDP growth around the world: 6 pts] The graph below plots the growth rate of real GDP per capita from 1990 to 2019, against initial real GDP per capita in 1990, for the U.S. and six other countries.



Which countries' real GDP per capita *converged* toward that of the United States over this period? Answer YES or NO.

a. Bolivia

d. Mexico

b. Brazil

e. Chile

c. Costa Rica

f. Columbia

III. Critical thinking: Write a one-paragraph essay answering *one* question below (your choice). [4 pts]

- (1) Can the government influence the fraction of GDP devoted to consumption spending (C/Y)? If so, how? If not, why not?
- (2) Can the government influence the fraction of GDP devoted to private investment spending (I/Y)? If so, how? If not, why not?

Please circle the question you are answering and write your answer below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.

[end of exam]