

The following information is for 1) - 4). The following table gives symbols for prices and quantities in an economy in two years. Hints: look at all of the questions before you start answering them; write out the formula for the answer to each question in the blank space, then find it in the list of answers.

Year	Apples		Bananas	
	Quantity	Price	Quantity	Price
1	QA1	PA1	QB1	PB1
2	QA2	PA2	QB2	PB2

1) Which of the lines below gives you the formula for a *Laspeyres price index* (like the CPI) in year 2 base year 1?

- a) $[(QA2 \times PA1) + (QB2 \times PB1)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- b) $[(QA1 \times PA2) + (QB1 \times PB2)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- c) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA1 \times PA2) + (QB1 \times PB2)]$
- d) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA2 \times PA1) + (QB2 \times PB1)]$
- e) None of the above

2) Which of the lines below gives you the formula for a *Laspeyres quantity index* in year 2, base year 1?

- a) $[(QA2 \times PA1) + (QB2 \times PB1)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- b) $[(QA1 \times PA2) + (QB1 \times PB2)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- c) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA1 \times PA2) + (QB1 \times PB2)]$
- d) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA2 \times PA1) + (QB2 \times PB1)]$
- e) None of the above

3) Which of the lines below gives you the formula for a *Paasche price index* in year 2, base year 1?

- a) $[(QA2 \times PA1) + (QB2 \times PB1)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- b) $[(QA1 \times PA2) + (QB1 \times PB2)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- c) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA1 \times PA2) + (QB1 \times PB2)]$
- d) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA2 \times PA1) + (QB2 \times PB1)]$
- e) None of the above

4) Which of the lines below gives you the formula for a *Paasche quantity index* in year 2, base year 1?

- a) $[(QA2 \times PA1) + (QB2 \times PB1)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- b) $[(QA1 \times PA2) + (QB1 \times PB2)] / [(QA1 \times PA1) + (QB1 \times PB1)]$
- c) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA1 \times PA2) + (QB1 \times PB2)]$
- d) $[(QA2 \times PA2) + (QB2 \times PB2)] / [(QA2 \times PA1) + (QB2 \times PB1)]$
- e) None of the above

The following information is for 5) and 6). Here are values of a Laspeyres price index and a Paasche price index for two years.

Year	Laspeyres	Paasche	Fisher ideal
2002	100	100	_____
2003	105	102	_____

5) What would be the value of a Fisher ideal price index for the year 2003?

- a) $(105 + 102) / 2$ b) $(105 \times 102) / 2$ c) $\sqrt{(105 + 102)}$ d) $\sqrt{(105 \times 102)}$ e) None of the above

6) Notice that the rate of inflation between the two years is higher for the Laspeyres price index. Which is the following is true?

- a) That is to be expected, because Laspeyres price indexes usually show a higher inflation rate.
b) That is not to be expected, because Paasche price indexes usually show a higher inflation rate.
c) That is neither expected nor unexpected, because Laspeyres and Paasche price indexes can show different inflation rates, but one does not tend to be higher than the other.
d) That is not to be expected, because Laspeyres and Paasche price indexes usually show the same rate of inflation.

The following information is for 7) and 8). Here are values of two index numbers. One covers 2002 and 2003. The other covers 2003 and 2004. The two index numbers are to be linked into one index number that covers all three years. The linked index number is to be set equal to 1 in the year 2002.

Year	Index number 1	Index number 2	Linked index number (2002 = 1)
2002	1		_____
2003	1.2	1	_____
2004		0.5	_____

7) What is the value of the linked index number for the year 2003?

- a) 1 b) 1.2 c) 0.5 d) 1.7 e) None of the above.

8) What is the value of the linked index number for the year 2004?

- a) 1 b) 1.2 c) 0.5 d) 1.7 e) None of the above.

The following information is for 9) - 11). Fill out the last column in the table, then answer the questions.

Year	Nominal GDP	Real GDP quantity index	Chained (2012) dollar real GDP
2011	1000	1	_____
2012	1200	2	_____
2013	1300	3	_____

9) What is the value of chained (2012) dollar real GDP for 2011?

- a) 600 b) 1000 c) 1200 d) 1300 e) None of the above

10) What is the value of chained (2012) dollar real GDP for 2012?

- a) 600 b) 1000 c) 1200 d) 1300 e) None of the above

11) What is the value of chained (2012) dollar real GDP for 2013?

- a) 600 b) 1000 c) 1200 d) 1300 e) None of the above

12) Here is some information about a factory that makes shoes. What is value added for this factory?

Revenue from sales of shoes	\$10
Wages and salaries of employees	\$5
Cost of leather	\$1
Cost of fuel to run the factory	\$2
Rent paid to owner of factory	\$2

building and machinery
Value added is: a) \$0 b) \$1 c) \$2 d) \$3 e) None of the above

The following information is for 13) and 14). Suppose an economy has this aggregate production function:

$$Y = 10 + 6K^{1/3}L^{2/3} + 2L$$

13) What is the marginal product of labor in the economy?

a) $4K^{1/3}L^{-1/3} + 2$ b) $4K^{1/3}L^{-1/3}$ c) $2K^{-1/3}L^{-2/3}$ d) $10 + 4K^{1/3}L^{-2/3} + 2$ e) None of the above

14) What is the marginal product of capital in the economy?

a) $4K^{1/3}L^{-1/3} + 2$ b) $4K^{1/3}L^{-1/3}$ c) $2K^{-2/3}L^{2/3}$ d) $10 + 4K^{1/3}L^{-2/3} + 2$ e) None of the above

15) Here is an exercise in "growth accounting." Given the information below, what was the average percent rate of growth of Total Factor Productivity (A) in the economy? Hint: do the math!

Share of national income going to owners of capital:	1/3
Average annual growth in real GDP:	8 %
Average annual growth in capital stock	9%
Average annual growth in labor input	6%

a) 0 % b) 1% c) 2% d) 3% e) None of the above

The figure to the right is for 16) - 18). It depicts a Solow model of economic growth with a savings rate s , a depreciation rate δ and a rate of population growth n . The numbers on the vertical axis are units of stuff per worker.

16) What is long-run equilibrium (steady-state) output per worker?

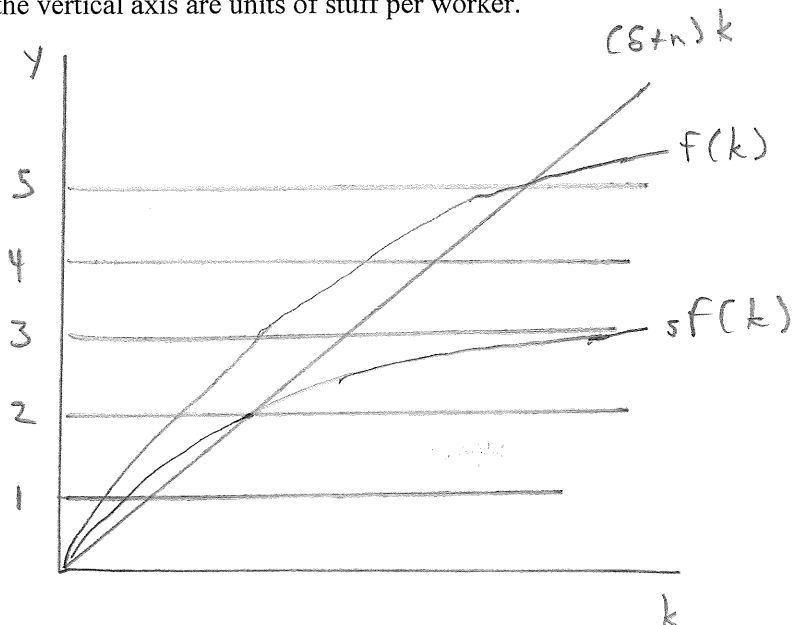
a) 1 b) 2 c) 3 d) 4 e) 5

17) What is long-run equilibrium (steady-state) savings per worker?

a) 1 b) 2 c) 3 d) 4 e) 5

18) What is long-run equilibrium (steady-state) consumption per worker?

a) 1 b) 2 c) 3 d) 4 e) 5



The following is for 19) - 21). Consider the following list of possible events in an economy described by the Solow model of economic growth:

- I) An increase in n
- II) An increase in δ
- III) An increase in s
- IV) An event that suddenly destroys capital, such as fire or flood

19) Which of the events change output per worker y in the very short run but NOT in the long run steady state?

- a) I, II, III, IV b) I, II, III only c) I, II only d) III and IV only e) IV only

20) Which of the events change output per worker in the long-run steady state but NOT in the very short run?

- a) I, II, III, IV b) I, II, III only c) I, II only d) III and IV only e) IV only

21) Which of the events *decrease* output per worker in the long-run steady state?

- a) I, II, III, IV b) I, II, III only c) I, II only d) III and IV only e) IV only

The following is for 22)- 25). Consider a Solow model in which the depreciation rate is 0.10 (ten percent), the population (or labor force) growth rate is also 0.10 (10 percent), and the savings rate is 0.05 (5 percent). Unlike the model presented in class, the aggregate production function is not Cobb-Douglas: it is $Y = 2K + 100L$. Do calculations below.

22) What is the per-worker production function in this economy?

- a) $y = 2k + 100$ b) $y = 2k + 100l$ c) $y = 2 + 100k$ d) $y = 2k^{1/2}$ e) None of the above

23) What is the value of long-run steady state capital per worker k^* in this economy?

- a) 200 b) 100 c) 50 d) 10 e) None of the above

24) What is the value of long-run steady state output per worker y^* in this economy?

- a) 200 b) 100 c) 50 d) 10 e) None of the above

25) What is the value of long-run steady state savings or investment per worker in this economy?

- a) 200 b) 100 c) 50 d) 10 e) None of the above

The following information is for 26) - 28). Consider a closed economy with an expectations-augmented Phillips curve and an IS curve. The natural rate of interest is 3 percent. The natural rate of unemployment (or NAIRU) \bar{u} is 6 percent. There are no supply shocks in this economy. Hint: write down the Phillips curve equations below.

26) Suppose expected inflation is 2 percent, and realized inflation this year is 1 percent. What do you know about the unemployment rate this year?

- a) It must be equal to 6 percent. b) It must be less than 6 percent. c) It must be greater than 6 percent.
d) That information does not imply anything about the unemployment rate. e) None of the above.

27) Suppose expected inflation is 2 percent, and realized inflation this year is 3 percent. What do you know about real GDP this year?

- a) It is equal to potential GDP (the natural rate of output) b) It is greater than potential GDP (the natural rate of output)
c) It is less than potential GDP (the natural rate of output) d) That information does not imply anything about real GDP
e) None of the above.

28) Suppose expected inflation is 2 percent, and realized inflation this year is 3 percent. What do you know about the real interest rate this year?

- a) It is equal to 3 percent b) It is greater than 3 percent c) It is less than 3 percent
d) That information does not imply anything about the real interest rate. e) None of the above.

The following is for 29) - 31). Consider a closed economy in which output is always equal to the natural rate of output ($Y = \bar{Y}$). What will happen to *investment* and the *real interest rate* in the economy (which is the natural rate of interest, because $Y = \bar{Y}$) in response to the following events? Hint: write down the equation for \bar{S} and draw loanable funds graphs.

29) There is a decrease in government transfer spending.

- a) I up, r up. b) I up, r down. c) I down, r up. d) I down, r down. e) None of the above.

30) There is a decrease in the parameter a in the consumption function $Y = a + b(Y - T)$.

- a) I up, r up. b) I up, r down. c) I down, r up. d) I down, r down. e) None of the above.

31) There is decrease in the parameter c in the investment function $I = c - dr$.

- a) I up, r up. b) I up, r down. c) I down, r up. d) I down, r down. e) None of the above.

For 32)- 35), consider a small open economy in the long run (that is, assume $Y = \bar{Y}$). In this economy, as in class:

$$Y = C + I + G + NX \quad C = a + b(Y - T) \quad I = c - dr \quad G = \bar{G} \quad T = \bar{T}$$

$$NX = z - j\epsilon$$

What happens to the economy's net capital outflow (NCO), net exports (NX) and real exchange rate in response to the following events, assuming everything else remains fixed? Hints: start by writing down an equation for national savings \bar{S} ; in the spaces I left below draw graphs; for simplicity assume that "before" the economy is in a state of *balanced trade*.

32) There is a decrease in decrease in government purchases of goods and services.

- a) NCO increases, NX increases, real exchange rate depreciates (ϵ decreases)
- b) NCO increases, NX decreases, real exchange rate appreciates (ϵ increases)
- c) NCO decreases, NX increases, real exchange rate depreciates (ϵ decreases).
- d) NCO decreases, NX decreases, real exchange rate appreciates (ϵ increases).
- e) None of the above.

33) There is an increase in the world real interest rate r^* .

- a) NCO increases, NX increases, real exchange rate depreciates (ϵ decreases)
- b) NCO increases, NX decreases, real exchange rate appreciates (ϵ increases)
- c) NCO decreases, NX increases, real exchange rate depreciates (ϵ decreases).
- d) NCO decreases, NX decreases, real exchange rate appreciates (ϵ increases).
- e) None of the above.

34) There is an increase in foreign demand for the country's exports, at any given real exchange rate ϵ .

- a) NCO increases, NX increases, real exchange rate depreciates (ϵ decreases)
- b) NCO increases, NX decreases, real exchange rate appreciates (ϵ increases)
- c) NCO decreases, NX increases, real exchange rate depreciates (ϵ decreases).
- d) NCO decreases, NX decreases, real exchange rate appreciates (ϵ increases).
- e) None of the above.

35) There is an increase in the amount of investment spending firms want to do at any given real interest rate r .

- a) NCO increases, NX increases, real exchange rate depreciates (ϵ decreases)
- b) NCO increases, NX decreases, real exchange rate appreciates (ϵ increases)
- c) NCO decreases, NX increases, real exchange rate depreciates (ϵ decreases).
- d) NCO decreases, NX decreases, real exchange rate appreciates (ϵ increases).
- e) None of the above.

The following information is for questions 36)- 38). They are about money. Use the list below to answer the questions.

- I) Real interest rate
- II) Store of value
- III) Unit of account
- IV) Nominal interest rate
- V) Reserve requirement
- VI) Sacrifice ratio
- VII) Medium of exchange

36) What are the three functions of money?

- a) I, II, III b) II, III, IV c) II, IV, VI d) II, IV, VI e) None of the above

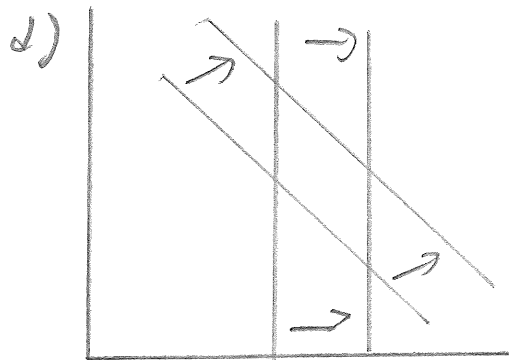
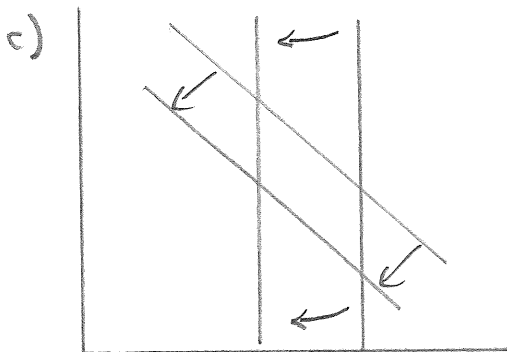
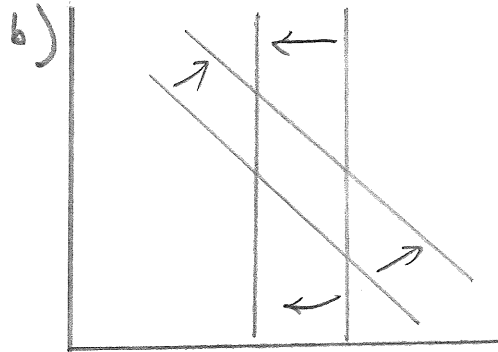
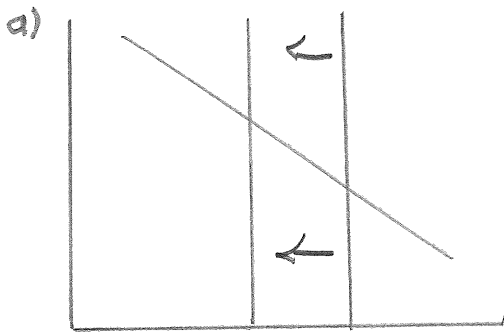
37) What are the two less-important functions of money - functions that are usually, but not always performed by the money of a country?

- a) I, II b) II, III c) III, IV d) IV, V e) None of the above

38) What is the opportunity cost of holding money?

- a) I b) II c) III d) IV e) None of the above

The following graphs are for questions 39) - 41). They depict supply and demand of real money balances in an economy. I will ask you to tell me which graph corresponds to a particular event. More than one event may correspond to a given graph.



39) A decrease in real GDP Y . a) b) c) d) e) None of the above

40) A decrease in the money supply M^S , holding P fixed. a) b) c) d) e) None of the above

41) An increase in the price level P , holding M^S fixed. a) b) c) d) e) None of the above

The following information is for 42)-45). Consider an economy in which the central bank chooses an interest rate and adjusts the money supply as needed to keep the interest rate at that chosen value. The central bank always tries to keep inflation exactly equal to a target inflation rate of 2 percent. The natural rate of unemployment (NAIRU) u^n is 6 percent. The central bank always knows the true value of potential output \bar{Y} . There are no "supply shocks." Think about the value that the central bank will choose for r in each situation below. Given that choice for r , what will happen in the economy?

42) The public's expected value for future inflation is 2 percent. Government purchases, taxes net of transfers and other determinants of spending all turn out to be as the central bank expected when it set the interest rate. Results for u and π :

- a) $u = 6$ percent, inflation = 2 percent
- b) $u < 6$ percent, inflation > 2 percent.
- c) $u > 6$ percent, inflation < 2 percent.
- d) $u = 6$ percent, inflation > 2 percent.
- e) $u = 6$ percent, inflation < 2 percent.

43) The public's expected value for future inflation is 1 percent. Government purchases, taxes net of transfers and other determinants of spending all turn out to be as the central bank expected when it set the interest rate. Results for u and π :

- a) $u = 6$ percent, inflation = 1 percent
- b) $u < 6$ percent, inflation > 1 percent.
- c) $u > 6$ percent, inflation < 1 percent.
- d) $u = 6$ percent, inflation > 1 percent.
- e) None of the above.

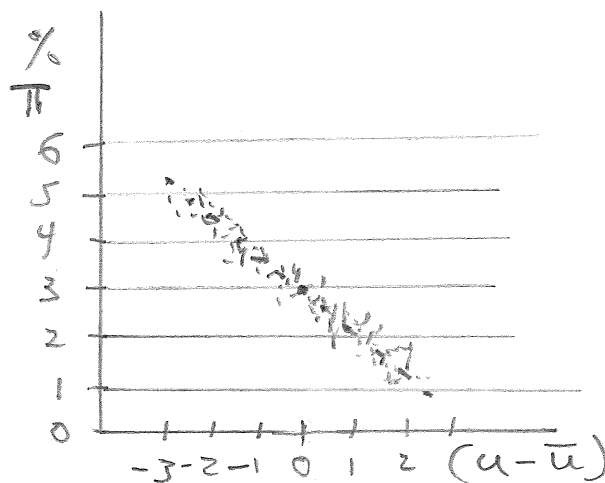
44) The public's expected value for future inflation is 3 percent. Government purchases, taxes net of transfers and other determinants of spending all turn out to be as the central bank expected when it set the interest rate. Results for u and π :

- a) $u = 6$ percent, inflation = 3 percent
- b) $u < 6$ percent, inflation > 3 percent.
- c) $u > 6$ percent, inflation < 3 percent.
- d) $u = 6$ percent, inflation > 3 percent.
- e) None of the above.

45) The public's expected value for future inflation is 2 percent. Government purchases turn out to be *less* than the central bank expected when it set the interest rate. Results for u and π :

- a) $u = 6$ percent, inflation = 2 percent
- b) $u < 6$ percent, inflation > 2 percent.
- c) $u > 6$ percent, inflation < 2 percent.
- d) $u = 6$ percent, inflation > 2 percent.
- e) None of the above.

46) The figure to the right is a scatterplot, like one presented in class, of data on inflation and unemployment in an economy in which the central bank has an inflation target, and expectations are anchored, equal to that target. What is the inflation target likely to be?



- a) 1 percent
- b) 2 percent
- c) 3 percent
- d) I do not have enough information to say
- e) None of the above

Written questions

I) **10 pts.** This question is about the equilibrium unemployment rate. Suppose that, as in the model presented in class, The total labor force L is made up of employed people and unemployed people.

U is the total number of unemployed people.

E is the total number of employed people.

The unemployment rate is $u = U/L$.

The number of employed people losing jobs in a period is sE where s is a fraction (between zero and one).

The number of unemployed people finding jobs in a period is fU where f is a fraction (between zero and one).

But unlike the model presented in class, the size of the labor force is not fixed. Instead, it is growing. In every period, there are new entrants to the labor force. New entrants enter the pool of unemployed, just like the existing workers who become unemployed in that period. The number of new entrants to the labor force in a period is equal to gL where g is a fraction between zero and one, and L is the size of the labor force in that period. Derive the long-run equilibrium value of the unemployment rate u . Show your work!

II) Hint: look at all parts of this question before you begin to answer it. Consider a closed economy in which

$$Y = C + I + G$$

$$C = a + b(Y - T)$$

$$I = c - dr + mY$$

$$G = \bar{G}$$

$$T = \bar{T}$$

Note that this economy is somewhat different from the one in the model presented in the textbook and class. Here investment spending is positively related to real GDP Y , because an increase in a firm's sales tends to increase the expected marginal product of capital investment in the firm. m is the coefficient that gives the magnitude of this relationship. Also, in the textbook model, the marginal propensity to consume b was positive, but less than one. In this model, both b and m are positive, but it is also true that $(b+m)$ is less than one.

1) **5 pts.** Using algebra, derive the "spending equation, that is the equation we used to describe shifts in the IS curve. This equation has Y alone on the left-hand side, and on the right-hand side it has r , \bar{G} and \bar{T} .

2) **5 pts.** In this economy, like the textbook one, an increase in \bar{G} shifts the IS curve to the right (out). But what the magnitude of this shift, relative to that in the textbook model? For a given increase in \bar{G} (a given $\Delta\bar{G}$), is the shift in the IS curve bigger, smaller, or the same as in the classroom model? Explain, using your answer to 1).

3) **5 pts.** I said that in the new model $(b+m)$ is less than one. Why did we have to assume this? Explain, using your answer to 1).

4) **5 pts.** Now, using algebra, derive the equation we used to describe the effect of changes in \bar{G} , \bar{T} and \bar{Y} on the natural rate of interest \bar{r} . This equation has r alone on the left-hand side, and on the right-hand side it has \bar{G} , \bar{T} and \bar{Y} .

5) **5 pts.** Finally, draw a “loanable funds” graph for this economy. Using this graph, show what happens to the natural rate of interest \bar{r} if there is an increase in the natural rate of output \bar{Y} .