Economics 132.03

Principles of Macroeconomics

Spring 2009

Professor Peter Ireland

http://www2.bc.edu/~irelandp/ec132.html

First Midterm Exam

This exam has 9 questions on 3 pages; before you begin, please check to make sure your copy has all 9 questions and all 3 pages. Each of the 9 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. What happens to US gross domestic product (GDP) and its four main components when …

    a. A US household buys a new refrigerator, manufactured by a US firm?
    b. Ford Motor Company (a US firm) produces a new car, which sits in a US auto dealer's lot instead of being sold to a US consumer?
    c. The State of Massachusetts repaves part of the Massachusetts Turnpike?
    d. Honda (a Japanese firm) expands one of its factories that is located in the US?
    e. The value of assets like stocks, bonds, and mutual funds falls in the US?

2. The American Bakeries Corporation purchases $1 million worth of flour, eggs, and other ingredients to make cakes. At the same time, however, it pays its workers $500,000 in wages. American Bakeries then sells the cakes to a chain of grocery stores for $3 million. The grocery stores sell the cakes to individual consumers for $4 million, but then have to pay their employees $250,000 in wages. By how much does GDP go up as a result of all these transactions?

3. Consider a simple economy in which only two goods are produced and sold: pizza and beer. The prices and quantities produced of these two goods over a three-year period are shown in the table below.

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2006	$2	1	$2	1
2007	$2	3	$2	2
2008	$4	3	$8	2

   a. Calculate nominal GDP in 2006, 2007, and 2008.
   b. Next, using 2006 as your base year, calculate real GDP in 2006, 2007, and 2008.
   c. Does the GDP deflator rise between 2006 and 2007? Why or why not?
   d. Does the GDP deflator rise between 2007 and 2008? Why or why not?

4. Go back to the same example from question 3, just above. Consumers in the economy like two goods: pizza and beer. Prices and quantities consumed are the same as before:

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2006	$2	1	$2	1
2007	$2	3	$2	2
2008	$4	3	$8	2

   a. As a first step in computing the consumer price index (CPI), the Bureau of Labor Statistics surveys consumers to determine the "basket of goods" purchased by a typical consumer. Using 2006 as your base year, what is the basket of goods in this economy?
   b. What is the cost of the basket in each year: 2006, 2007, and 2008?
   c. Still using 2006 as the base year, what is the CPI in each year: 2006, 2007, 2008?
   d. Is percentage change in the CPI between 2006 and 2008 in this question larger than, smaller than, or the same as the percentage change in the GDP deflator between 2006 and 2008 in question 3? What explains the difference, if any?

5. Suppose that we see the GDP deflator rising at a faster rate than the CPI.

   a. Could this be because of a rapid rise in the price of imported oil? Why or why not?
   b. Could this be because of a rapid decline in the price of equipment and machinery purchased by firms, and therefore included in the investment component of GDP, because those goods contain microprocessors that are falling in price? Why or why not?

6. You are just appointed CEO of a large US corporation and sign a two-year contract that pays $1,000,000 (that is, $1 million) for 2009 and $1,050,000 (that is, $1 million plus 5 percent) for 2010, under the expectation that the inflation rate between this year and next will be 5 percent.

    a. Suppose that the inflation rate turns out to be 10 percent instead. Do the terms of your contract mean that you "win" or "lose" when inflation turns out to be higher than expected?
    b. Suppose that the inflation turns out to be 1 percent instead. Do the terms of your contract mean that you "win" or "lose" when inflation turns out to be lower than expected?
    c. Explain briefly how the consumer price index could be used instead to provide you with different contractual terms that would protect your 2010 salary against inflation but, at the same time, not expose you to this "gamble" as to whether you will "win" or "lose" if inflation comes in higher or lower than expected.

7. To measure most accurately the standard of living within any given country at any given point in time:

    a. Which measure of national income would be better to use, nominal GDP or real GDP? Why?
    b. And which is better: GDP (either nominal or real, depending on your answer from part (a) above) itself or GDP per person? Why?

8. Macroeconomists often use the story of Robinson Crusoe to help identify and understand the determinants of productivity in the United States.

    a. When macroeconomists say that Robinson Crusoe's productivity depends on how much training he has in the latest fishing techniques, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?
    b. When they say that Robinson Crusoe's productivity depends on how plentiful fish are in the waters surrounding his island, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?
    c. When they say that Robinson Crusoe's productivity depends on how many fishing poles he has, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?
    d. When they say that Robinson Crusoe's productivity depends on how good he is at inventing new techniques for fishing, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?

9. In the 1980's, Japanese investors made significant investments in the United States, both in the form of direct investments and portfolio investments. At the time, many Americans were unhappy with the fact that this investment was occurring.

    a. In what way was it better for the United States to have received this foreign investment than to not have received it?
    b. In what way would it have been better still if Americans themselves had made these investments?

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1. What happens to US gross domestic product (GDP) and its four main components when …

    a. A US household buys a new refrigerator manufactured by a US firm?

Consumption includes durables as well as nondurables and services, so C goes up and so does Y.

    b. Ford Motor Company (a US firm) produces a new car, which sits in a US auto dealer's lot instead of being sold to a US consumer?

Inventories are a component of investment, so I goes up and so does Y.

    c. The State of Massachusetts repaves part of the Massachusetts Turnpike?

State government spending gets included with federal and local government spending in computing total government purchases, so G goes up and so does Y.

    d. Honda (a Japanese firm) expands one of its factories that is located in the US?

What matters for US GDP is that the activity occurs within the US, not whether the activity is done by a domestic or foreign firm, so I goes up and so does Y.

    e. The value of assets like stocks, bonds, and mutual funds falls in the US?

GDP measures the value of goods and services produced, not the market value of existing assets, so GDP remains unchanged as do all of its components.

2. The American Bakeries Corporation purchases $1 million worth of flour, eggs, and other ingredients to make cakes. At the same time, however, it pays its workers $500,000 in wages. American Bakeries then sells the cakes to a chain of grocery stores for $3 million. The grocery stores sell the cakes to individual consumers for $4 million, but then have to pay their employees $250,000 in wages. By how much does GDP go up as a result of all these transactions?

The circular flow diagram reveals that GDP can measure either or both of: (i) the total value of all spending on final goods and services produced within a country during a given period of time or (ii) the total income earned by all factors of production located within the same country during the same period of time. In this case, the way to compute contribution to GDP is using the value of spending on the final good, that is, the spending on cakes by customers of the grocery stores. The contribution to GDP is $4 million.

3. Consider a simple economy in which only two goods are produced and sold: pizza and beer. The prices and quantities produced of these two goods over a three-year period are shown in the table below.

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2006	$2	1	$2	1
2007	$2	3	$2	2
2008	$4	3	$8	2

a. Calculate nominal GDP in 2006, 2007, and 2008.

2006: $2 x 1 + $2 x 1 = $4
2007: $2 x 3 + $2 x 2 = $10
2008: $4 x 3 + $8 x 2 = $28

b. Next, using 2006 as your base year, calculate real GDP in 2006, 2007, and 2008.

2005: $2 x 1 + $2 x 1 = $4
2006: $2 x 3 + $2 x 2 = $10
2007: $2 x 3 + $2 x 2 = $10

c. Does the GDP deflator rise between 2006 and 2007? Why or why not?

No. Because quantities rise while prices remain unchanged, nominal and real GDP rise by the same amount, leaving the GDP deflator unchanged.

d. Does the GDP deflator rise between 2007 and 2008? Why or why not?

Yes. Because prices rise while quantities remain unchanged, nominal GDP rises but real GDP stays unchanged, and the GDP deflator rises too.

4. Go back to the same example from question 3, just above. Consumers in the economy like two goods: pizza and beer. Prices and quantities consumed are the same as before:

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2006	$2	1	$2	1
2007	$2	3	$2	2
2008	$4	3	$8	2

   a. As a first step in computing the consumer price index (CPI), the Bureau of Labor Statistics surveys consumers to determine the "basket of goods" purchased by a typical consumer. Using 2006 as your base year, what is the basket of goods in this economy?

The basket of goods consists of one pizza and one beer.

   b. What is the cost of the basket in each year: 2006, 2007, and 2008?

2006: $2 x 1 + $2 x 1 = $4
2007: $2 x 1 + $2 x 1 = $4
2008: $4 x 1 + $8 x 1 =$12

   c. Still using 2006 as the base year, what is the CPI in each year: 2006, 2007, 2008?

2005: $4/$4 x 100 = 100
2006: $4/$4 x 100 = 100
2007: $12/$4 x 100 = 300

   d. Is percentage change in the CPI between 2006 and 2008 in this question larger than, smaller than, or the same as the percentage change in the GDP deflator between 2006 and 2008 in question 3? What explains the difference, if any?

In this example, the inflation rate as measured by the CPI is larger than the inflation rate as measured by the GDP deflator. This is because of what macroeconomists call "substitution bias." The CPI holds the basket of goods fixed, even though consumers will tend to substitute away from goods, such as beer in this case, with prices that rise at relatively faster rates.

5. Suppose that we see the GDP deflator rising at a faster rate than the CPI.

   a. Could this be because of a rapid rise in the price of imported oil? Why or why not?

Since imported oil is, by definition, a good that is consumed but not produced in the country under consideration, a rise in its price will increase the CPI but not the GDP, so NO: this cannot explain why the GDP deflator is rising at a faster rate.

   b. Could this be because of a rapid decline in the price of equipment and machinery produced by some firms in the economy and purchased by other firms, and therefore included in the

investment component of GDP, because those goods contain microprocessors that are falling in price? Why or why not?

Since these investment goods are produced but not consumed in the country under consideration, their prices figure into the calculation of the GDP deflator but not the CPI. The answer is NO, however, because in the example the price of the investment goods are falling not rising.

6. You are just appointed CEO of a large US corporation and sign a two-year contract that pays $1,000,000 (that is, $1 million) for 2009 and $1,050,000 (that is, $1 million plus 5 percent) for 2010, under the expectation that the inflation rate between this year and next will be 5 percent.

    a. Suppose that the inflation rate turns out to be 10 percent instead. Do the terms of your contract mean that you "win" or "lose" when inflation turns out to be higher than expected?

You lose, because though your salary rises by 5 percent, the cost of living rises by still more and, on net, you fall behind.

    b. Suppose that the inflation turns out to be 1 percent instead. Do the terms of your contract mean that you "win" or "lose" when inflation turns out to be lower than expected?

You win, because your salary rises by 5 percent, but the cost of living rises by less and so, on net, you gain in real (inflation adjusted) terms.

    c. Explain briefly how the consumer price index could be used instead to provide you with different contractual terms that would protect your 2010 salary against inflation but, at the same time, not expose you to this "gamble" as to whether you will "win" or "lose" if inflation comes in higher or lower than expected.

Your salary could be protected against inflation while not exposing you to a gamble through "indexation," a practice according to which instead of specifying a specific salary for 2010, the contract would call for the salary to be increased at the same rate as the CPI, according to the formula: 2010 salary = 2009 salary x (CPI in 2010)/(CPI in 2009).

7. To measure most accurately the standard of living within any given country at any given point in time:

    a. Which measure of national income would be better to use, nominal GDP or real GDP? Why?

It is better to use real GDP, since what people really care about are not dollars per se, but the physical units of goods and services that those dollars can buy.

    b. And which is better: GDP (either nominal or real, depending on your answer from part (a) above) itself or GDP per person? Why?

It is better to use real GDP per person, since if GDP rises simply because of population growth, the income earned by the average consumer is not rising.

8. Macroeconomists often use the story of Robinson Crusoe to help identify and understand the determinants of productivity in the United States.

    a. When macroeconomists say that Robinson Crusoe's productivity depends on how much training he has in the latest fishing techniques, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?

Human capital per worker.

    b. When they say that Robinson Crusoe's productivity depends on how plentiful fish are in the waters surrounding his island, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?

Natural resources per worker.

    c. When they say that Robinson Crusoe's productivity depends on how many fishing poles he has, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?

Physical capital per worker.

    d. When they say that Robinson Crusoe's productivity depends on how good he is at inventing new techniques for fishing, what counterpart do they have in mind as to how productivity is determined in more complex economies like the US?

Technological knowledge.

9. In the 1980's, Japanese investors made significant investments in the United States, both in the form of direct investments and portfolio investments. At the time, many Americans were unhappy with the fact that this investment was occurring.

    a. In what way was it better for the United States to have received this foreign investment than to not have received it?

The Japanese investment made US workers more productive, increasing US workers' incomes.

    b. In what way would it have been better still if Americans themselves had made these investments?

If Americans had done the investment themselves, they would have earned the returns on that investment themselves, instead of those returns going back to Japan.

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Second Midterm Exam

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1. Suppose that Intel sells 1,000,000 newly-issued shares of stock to American savers.

    a. Is this sale of stock an example of direct finance or indirect finance?
    b. Are the newly-issues shares debt or equity?
    c. If Intel's sales decline because tough economic times cause other businesses to cut back on their computer purchases, what must Intel do first: make dividend payments to the holders of these newly-issued shares or make interest payments to the holders of its previously-issued bonds?

2. Consider a closed economy in which GDP (Y) equals \$15 billion, consumption (C) equals \$9 billion, government purchases (G) equal \$1.5 billion, and tax revenue (T) equals \$1 billion. Use this information to answer the following questions (*note:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic):

    a. What is investment equal to in this economy?
    b. What is national saving equal to in this economy?
    c. What is public saving equal to in this economy?
    d. What is private saving equal to in this economy?
    e. Is the government running a budget surplus or a budget deficit in this economy?

3. Suppose that the President and Congress decide to **raise** the rate at which savers must pay taxes on the interest payments they receive from bonds and the dividend payments they receive from stocks.

    a. Does this change in policy shift the demand curve or the supply curve in the market for loanable funds?
    b. Use a supply-and-demand diagram for loanable funds to show in which direction the relevant curve shifts.
    c. Does the interest rate rise or fall as a result of this change in policy?
    d. What happens to investment as a result of this change in policy?
    e. What effect would this policy have on the productivity of US workers?

4. For each case described below, indicate whether the person would be classified by the Bureau of Labor Statistics as employed, unemployed, or not in the labor force.

    a. William lost his job four months ago. He would like to work but gave up searching for a job six weeks ago.
    b. Frank quit his job six weeks ago and went back to school full time.
    c. Susan was fired six weeks ago. If the economy was better, she would look for a job, but she figures it's no use searching and decides to go back to school instead.
    d. Karen works part-time in her family's grocery store.
    e. Joe was just laid off from General Motors, but GM told him to expect to be called back to work within two weeks, so he doesn't bother to look for a new job.

5. Draw a supply-and-demand diagram for the labor market to show what happens when a labor union succeeds in bargaining for wages that are above the equilibrium wage; then use that diagram to answer the following questions:

    a. What happens to the wages paid to workers who remain employed?
    b. What happens to the number of workers who are actually employed?
    c. What happens to the number of workers who would like to work at the prevailing (union) wage?
    d. What happens to the number of workers who would be classified by the Bureau of Labor Statistics as unemployed?

6. Consider each of the following labor-market developments. In each case, indicate whether the event raises or lowers the natural rate of unemployment, and whether that effect arises because of a change in the amount of frictional unemployment or because of a change in the amount of structural unemployment.

    a. The government raises the minimum wage, already above the equilibrium wage, even higher.
    b. Networking sites like LinkedIn are created and allow employers to find workers more easily and workers to find jobs more easily.
    c. Firms start paying "efficiency wages."
    d. Investment banks have to let some employees with backgrounds in finance go because of losses in the financial markets, but at the same time the US Treasury decides to hire more specialists in finance to help the government help bail out those troubled banks.
    e. The US Congress and President pass legislation that makes it easier for labor unions to organize workers at more firms in more industries.

7. Bill has the following assets:

Asset	**Dollar Value**
Money market mutual funds	$8
Stock market mutual funds	$50
Currency	$7
Certificates of deposit	$11
Savings deposits	$20
Checking deposits	$3
Shares of General Motors stock	$100
Travelers' checks	$2

    a. What is the total dollar value of Bill's assets that are considered part of M1? (*note:* here and below, if you show the details of your calculations, we can give you partial credit even if you make a mistake with the arithmetic).
    b. What is the total dollar value of Bill's assets that are considered part of M2?
    c. Suppose that Bill also has a credit card, with $10 in charges on his most recent unpaid bill. How does taking this credit card debt into account change the dollar value of Bill's assets that are considered part of M2?

8. Consider an economy in which there are no banks.

    a. If the central bank conducts an open market operation in which it buys $100 of previously-issued government bonds from individual savers, what happens to the money supply?
    b. If, later, the central bank conducts a second open market operation in which it buys another $100 of previously-issued government bonds from individual savers, what happens to the money supply?
    c. If, after the first two open market operations described above, the central bank conducts a third open market operation in which it sells $50 in government bonds back to individual savers, what happens to the money supply?

9. Consider an economy in which the central bank has issued 100 $1 bills.

    a. If there are no banks in this economy, what is the value of the total money supply?
    b. If there are banks in this economy, if people deposit 50 of the $1 bills in these banks and hold the rest as currency, and if all banks hold 100% of their deposits as reserves, what is the total money supply?
    c. If there are banks in this economy, if people deposit all 100 of the $1 bills in these banks and therefore hold no currency, and if all banks hold 100% of their deposits as reserves, what is the total money supply?
    d. If there are banks in this economy, if people deposit all 100 of the $1 bills in these banks and therefore hold no currency, and if all banks hold 10% of their deposits as reserves, is the money supply going to be larger than, smaller than, or the same as what it was in part (c), above, in the case of 100% reserve banking?
    e. Comparing the last two cases from parts (c) and (d) above, is wealth created, destroyed, or left unchanged by the activities of the banking system when banks decide to hold only 10% of their deposits in the form of reserves instead of holding 100% of their deposits as reserves?

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Solutions to Second Midterm Exam

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1. Suppose that Intel sells 1,000,000 newly-issued shares of stock to American savers.

    a. Is this sale of stock an example of direct finance or indirect finance?

This is an example of direct finance, in which borrowers and savers interact directly in financial markets.

    b. Are the newly-issues shares debt or equity?

Shares of stock are equity.

    c. If Intel's sales decline because tough economic times cause other businesses to cut back on their computer purchases, what must Intel do first: make dividend payments to the holders of these newly-issued shares or make interest payments to the holders of its previously-issued bonds?

By law, Intel must make interest payments to its bondholders before paying dividends to these new shareholders.

2. Consider a closed economy in which GDP (Y) equals \$15 billion, consumption (C) equals \$9 billion, government purchases (G) equal \$1.5 billion, and tax revenue (T) equals \$1 billion. Use this information to answer the following questions (*note:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic):

a. What is investment equal to in this economy?

In a closed economy, net exports equal zero, so the national income accounting identity $Y = C + I + G + NX$ can be rearranged to calculate investment from the figures that are given as

$I = Y – C – G$ = \$15 billion - \$9 billion - \$1.5 billion = \$4.5 billion.

b. What is national saving equal to in this economy?

National saving is defined as $S = Y – C – G$ and therefore equals investment in a closed economy. It follows that national saving equals \$4.5 billion as well.

c. What is public saving equal to in this economy?

Public saving is defined as $T – G$ and can therefore be calculated as

$T – G$ = \$1 billion - \$1.5 billion = -\$0.5 billion.

d. What is private saving equal to in this economy?

Private saving is defined as $Y – C – T$ and can therefore be calculated as

$Y – C – T$ = \$15 billion - \$9 billion – \$1 billion = \$5 billion.

e. Is the government running a budget surplus or a budget deficit in this economy?

The government is running a budget deficit by spending more than it is receiving in taxes. This is why public saving in part (c) is negative.

3. Suppose that the President and Congress decide to **raise** the rate at which savers must pay taxes on the interest payments they receive from bonds and the dividend payments they receive from stocks.

   a. Does this change in policy shift the demand curve or the supply curve in the market for loanable funds?

This will shift the supply curve for loanable funds by affecting savers' willingness to save at any given interest rate.

   b. Use a supply-and-demand diagram for loanable funds to show in which direction the relevant curve shifts.

The graph should show the supply curve for loanable funds shifting to the left, with less loanable funds supplied at any given interest rate.

   c. Does the interest rate rise or fall as a result of this change in policy?

The interest rate rises.

d. What happens to investment as a result of this change in policy?

The equilibrium quantity of loanable funds falls, and so does investment. Although the change in tax policy affects savers directly, it also affects borrowers through the increase in the interest rate that results.

e. What effect would this policy have on the productivity of US workers?

Since the reduction in investment means that there is less physical capital per worker than there would otherwise be, the productivity of US workers will also be lower than it would otherwise be.

4. For each case described below, indicate whether the person would be classified by the Bureau of Labor Statistics as employed, unemployed, or not in the labor force.

   a. William lost his job four months ago. He would like to work but gave up searching for a job six weeks ago.

Not in the labor force. He does not have a job but is a discouraged worker and therefore not in the labor force rather than unemployed.

   b. Frank quit his job six weeks ago and went back to school full time.

Not in the labor force. He does not have a job but is not looking for one.

   c. Susan was fired six weeks ago. If the economy was better, she would look for a job, but she figures it's no use searching and decides to go back to school instead.

Not in the labor force. She is a discouraged worker as well.

   d. Karen works part-time in her family's grocery store.

Employed. Even part-time workers are counted as employed.

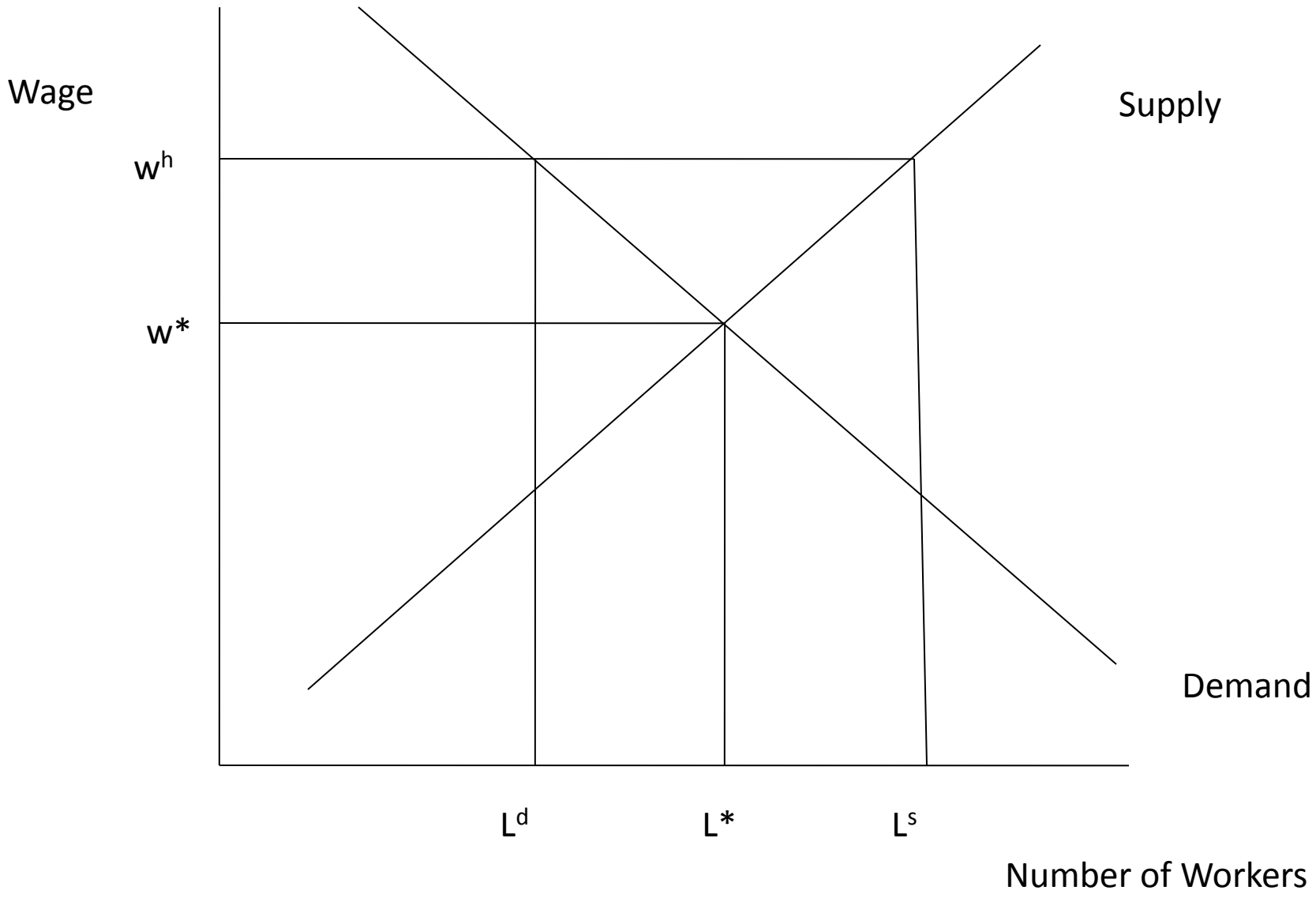
   e. Joe was just laid off from General Motors, but GM told him to expect to be called back to work within two weeks, so he doesn't bother to look for a new job.

Unemployed. Workers on temporary layoff are counted as unemployed.

5. Draw a supply-and-demand diagram for the labor market to show what happens when a labor union succeeds in bargaining for wages that are above the equilibrium wage; then use that diagram to answer the following questions:

Please see the diagram on the next page.

   a. What happens to the wages paid to workers who remain employed?


Wage
Supply
w^h
w^*
Demand
L^d
L^*
L^s
Number of Workers

The wage rises from w^* to w^h.

b. What happens to the number of workers who are actually employed?

Employment falls from L^* to L^d.

c. What happens to the number of workers who would like to work at the prevailing (union) wage?

The number of workers who would like to work rises from L^* to L^s.

d. What happens to the number of workers who would be classified by the Bureau of Labor Statistics as unemployed?

The number of workers who would be classified as unemployed rises from zero to $L^s - L^d$.

6. Consider each of the following labor-market developments. In each case, indicate whether the event raises or lowers the natural rate of unemployment, and whether that effect arises because of a change in the amount of frictional unemployment or because of a change in the amount of structural unemployment.

a. The government raises the minimum wage, already above the equilibrium wage, even higher.

The natural rate of unemployment goes up because of an increase in the amount of structural unemployment.

b. Networking sites like LinkedIn are created and allow employers to find workers more easily and workers to find jobs more easily.

The natural rate of unemployment goes down because of a decrease in the amount of frictional unemployment.

c. Firms start paying "efficiency wages."

The natural rate of unemployment goes up because of an increase in the amount of structural unemployment.

d. Investment banks have to let some employees with backgrounds in finance go because of losses in the financial markets, but at the same time the US Treasury decides to hire more specialists in finance to help the government help bail out those troubled banks.

The natural rate of unemployment goes up because of an increase in the amount of frictional unemployment.

e. The US Congress and President pass legislation that makes it easier for labor unions to organize workers at more firms in more industries.

The natural rate of unemployment goes up because of an increase in the amount of structural unemployment.

7. Bill has the following assets:

Asset	**Dollar Value**
Money market mutual funds	$8
Stock market mutual funds	$50
Currency	$7
Certificates of deposit	$11
Savings deposits	$20
Checking deposits	$3
Shares of General Motors stock	$100
Traveler's checks	$2

a. What is the total dollar value of Bill's assets that are considered part of M1? (*note:* here and below, if you show the details of your calculations, we can give you partial credit even if you make a mistake with the arithmetic).

M1 = Currency + Travelers' Checks + Checking Deposits = $7 + $2 + $3 = $12.

b. What is the total dollar value of Bill's assets that are considered part of M2?

M2 = M1 + Money Market Mutual Funds + Certificates of Deposit + Savings Deposits = $12 + $8 + $11 + $20 = $51.

c. Suppose that Bill also has a credit card, with $10 in charges on his most recent unpaid bill. How does taking this credit card debt into account change the dollar value of Bill's assets that are considered part of M2?

Credit cards and credit card debt are not accounted for in computing either M1 or M2, so the value of Bill's assets that are considered part of M2 does not change.

8. Consider an economy in which there are no banks.

a. If the central bank conducts an open market operation in which it buys $100 of previously-issued government bonds from individual savers, what happens to the money supply?

This open market purchase increases the money supply by $100.

b. If, later, the central bank conducts a second open market operation in which it buys another $100 of previously-issued government bonds from individual savers, what happens to the money supply?

This additional open market purchase increases the money supply by an additional $100.

c. If, after the first two open market operations described above, the central bank conducts a third open market operation in which it sells $50 in government bonds back to individual savers, what happens to the money supply?

This open market sale decreases the money supply by $50.

9. Consider an economy in which the central bank has issued 100 $1 bills.

a. If there are no banks in this economy, what is the value of the total money supply?

Money Supply = Currency + Deposits = $100 + $0 = $100.

b. If there are banks in this economy, if people deposit 50 of the $1 bills in these banks and hold the rest as currency, and if all banks hold 100% of their deposits as reserves, what is the total money supply?

Money Supply = Currency + Deposits = $50 + $50 = $100.

c. If there are banks in this economy, if people deposit all 100 of the $1 bills in these banks and therefore hold no currency, and if all banks hold 100% of their deposits as reserves, what is the total money supply?

Money Supply = Currency + Deposits = $0 + $100 = $100.

d. If there are banks in this economy, if people deposit all 100 of the $1 bills in these banks and therefore hold no currency, and if all banks hold 10% of their deposits as reserves, is the money supply going to be larger than, smaller than, or the same as what it was in part (c), above, in the case of 100% reserve banking?

Under fractional reserve banking, banks affect the level of the money supply as well as the composition of the money supply. In particular, the money supply will be larger with 10% reserves than with 100% reserves.

e. Comparing the last two cases from parts (c) and (d) above, is wealth created, destroyed, or left unchanged by the activities of the banking system when banks decide to hold only 10% of their deposits in the form of reserves instead of holding 100% of their deposits as reserves?

As noted both in class and in Mankiw's book, banks in a fractional reserve system create liquidity but not wealth. Wealth is left unchanged moving from the case considered in part (c) of this question to the case considered in part (d).

Economics 132.03

Principles of Macroeconomics

Spring 2009

Professor Peter Ireland

http://www2.bc.edu/~irelandp/ec132.html

Final Exam

This exam has 12 questions on 5 pages; before you begin, please check to make sure your copy has all 12 questions and all 5 pages. Each of the 12 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. Macroeconomists sometimes think about the determinants of a nation's standard of living with the help of an "aggregate production function" such as

$$Y = AF(L,K,H,N),$$

where Y denotes real GDP, L the number of workers, K the stock of physical capital, H the stock of human capital, N the stock of natural resources, and A the stock of technological knowledge.

   a. What does it mean to say that holding the stock of technological knowledge fixed, the aggregate production function has the property of constant returns to scale?
   b. Assuming that this aggregate production function has this property of constant returns to scale, rewrite the equation from above as one that shows how productivity (output per worker) depends on four determinants: physical capital per worker, human capital per worker, natural resources per worker, and the stock of technological knowledge.
   c. The British economist Thomas Robert Malthus (1766-1834) famously predicted that because natural resources are limited, population growth would inevitably lead to declining standards of living, perhaps to the point that societies are doomed to suffer from chronic poverty. Explain *briefly* (no more than a sentence or two), how Malthus' reasoning is reflected in your equation from part (b) above.
   d. Thankfully, Malthus' prediction has proven to be far too pessimistic; instead of declining towards poverty, living standards in many countries around the world have grown enormously over the past 200 years. According to your equation from part (b) above, what economic factors allow for rising productivity and living standards, even as supplies of natural resources dwindle over time?

2. In 1980, the nominal interest rate in the US economy was 10 percent and the inflation rate was 8 percent. In 1990, the nominal interest rate was 7 percent and the inflation rate was 3 percent.

    a. Assuming that the nominal interest rates quoted above apply to both borrowing and saving, during which year was it more costly in real terms to borrow: 1980 or 1990?
    b. During which year was it more rewarding in real terms to save: 1980 or 1990?

3. During the first three months of 2009, the number of American workers counted by the Bureau of Labor Statistics as being employed decreased by 2,451,000 (that is, by almost 2 1/2 million) yet, over the same period, the number of American workers counted by the BLS as being unemployed increased by only 2,053,000 (that is, by just a little more than 2 million).

    a. Explain *briefly* (no more than a sentence or two) how these two numbers can be consistent with one another.
    b. In light of the two statistics given above, would you say that the rise in the unemployment rate from 7.2 percent to 8.5 percent during the first three months of 2009 overstates or understates the severity of the recession as felt by US workers?
    c. If the US labor market begins to recover later this year, which would you expect to be larger in magnitude: the size of the increase in the number of workers who are counted as employed or the size of the decrease in the number of workers who are counted as unemployed?

4. Consider an economy in which people hold all of their money in the form of deposits and therefore do not hold currency. Suppose that all banks in this economy hold 10% of their deposits as reserves. And suppose that in this economy, the central bank decides to conduct an open market operation in which it purchases $100 in government bonds.

    a. Will this open market operation work to increase or decrease the money supply?
    b. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total amount of reserves have changed?
    c. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total money supply have changed?
    d. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total amount of deposits have changed?
    e. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total amount of loans have changed?

5. Suppose that the Federal Reserve decides to conduct monetary policy by setting a target *Res** for reserves, conducting open market operations to supply *Res** dollars in reserves to the banking system, and then accepting whatever outcome for the federal funds rate works to equate that fixed (inelastic) supply of reserves with banks' demand for reserves.

    a. Draw a supply-and-demand diagram for the market for reserves that shows how the federal funds rate gets determined under this monetary policy strategy.
    b. Suppose that the Federal Reserve continues to follow this "reserve targeting" strategy, but decides to conduct another open market operation that increases the fixed supply of reserves from *Res** to a larger amount *Res***. Does this open market operation work to raise the federal funds rate, lower the federal funds rate, or keep the federal funds rate unchanged?
    c. What happens to the total money supply (currency plus deposits) after this open market operation: does it go up, go down, or stay the same?

6. Suppose that at the beginning of the business day, the First National Bank's balance sheet looks like this:

First National Bank

Assets	**Liabilities**
Reserves $10 Loans $90 Other assets $10	Deposits $100 Shareholder's equity $10

    a. What reserve ratio has the bank chosen?
    b. If, during the business day, the bank experiences no problems with its loans but experiences a $50 deposit outflow, that is, a situation in which the bank's depositors ask to withdraw $50 from their accounts, is the bank "illiquid" or "insolvent?"
    c. Suppose that the bank borrows $45 in the "federal funds market" to cope with this deposit outflow. Is it borrowing from another bank or from the Federal Reserve?
    d. Draw a diagram similar to the one above that shows what the bank's balance sheet looks like after it has experienced the $50 deposit outflow as in part (b) and borrowed $45 as in part (c).

7. This question asks you to use microeconomic supply and demand analysis applied to the market for money to consider the long-run effects of a **decrease** in the money supply.

    a. To begin, draw a diagram with the quantity of money measured in dollars on the x-axis and the "goods price of money" measured as 1/P, where P is the economy-wide price level, on the y-axis. Then draw in a demand curve for money.
    b. Assuming for simplicity that the Federal Reserve is able to fix the money supply at some initial level M*, draw in the supply curve for money.
    c. Show what happens in the graph when the Federal Reserve acts to decrease the money supply to a new, lower level M**.
    d. What happens to the price level P as a result of this decrease in the money supply?

8. Suppose that the money supply is $100, the velocity of money is 4, and real GDP is 200.

    a. What is nominal GDP?
    b. What is the price level (the GDP deflator)?
    c. Assuming that the velocity of money is constant, what will nominal GDP equal if the Fed acts to increase the money supply to $200?
    d. Assuming that the velocity of money is constant and that "money is neutral in the long run," what will real GDP equal in the long run if the Fed acts to increase the money supply to $200?
    e. Still assuming that the velocity of money is constant and that money is neutral in the long run, what will the price level equal in the long run if the Fed acts to increase the money supply to $200?

9. Suppose that two countries have before-tax real interest rates, inflation rates, and tax rates on nominal interest income as follows:

Country	**A**	**B**
Before-tax real interest rate	4%	4%
Inflation rate	0%	4%
Tax rate on nominal interest income	50%	50%

    a. Find the before-tax nominal interest rates in countries A and B.
    b. Find the after-tax nominal interest rates in countries A and B.
    c. Find the after-tax real interest rates in countries A and B.
    d. Notice that both countries have the same before-tax real interest rates and the same tax rates on nominal interest income. In which country are the incentives (rewards) for private saving stronger: country A with low inflation or country B with high inflation?

10. For each part of this question, please indicate whether the fact mentioned helps explain why, in the aggregate demand/aggregate supply diagram: (i) the aggregate demand curve slopes down, (ii) the long-run aggregate supply curve is vertical, or (iii) the short-run aggregate supply curve slopes up.

    a. Firms and workers negotiate wages based on their price expectations, then those wages remain "sticky" for a period of time.
    b. Money is neutral in the long run.
    c. Some firms set their individual prices based on their expectations of the prices of all goods and services that they think will prevail economywide, then those prices remain "sticky" for a period of time.
    d. When the real value of monetary wealth rises, some consumers buy more goods and services.
    e. When the real value of monetary wealth rises, other consumers buy more bonds.

11. For each part of this question, please indicate whether the event works initially (that is, in the short run) in the aggregate demand/aggregate supply diagram to shift the (i) aggregate demand curve, (ii) the long-run aggregate supply curve, or (iii) the short-run aggregate supply curve.

    a. Expectations of future inflation rise, so that employers have to pay higher wages.
    b. Housing prices rise rapidly, as they did in the US during the first half of the current decade.
    c. The Federal Reserve lowers its target for the federal funds rate.
    d. Business owners become less confident about future prospects for the US economy.
    e. The US Congress and President pass a "stimulus package" that calls for large increases in government purchases.

12. Suppose that the economy starts in a long-run equilibrium.

    a. Draw the aggregate demand/aggregate supply diagram to illustrate this initial state of the economy, showing the aggregate demand curve together with both the short-run and the long-run aggregate supply curves.
    b. Now suppose that stock prices fall sharply, as they have in the US over the past year. Use the diagram to show what happens to output and the price level in the short run.
    c. Suppose that there are no changes in monetary or fiscal policy. If the decline in the stock market turns out to be only temporary, so that equity prices soon return to their previous levels, what will happen in the diagram to bring output back to its natural rate? What happens to the price level in the long run as a result?
    d. If there are no changes in monetary or fiscal policy, but the fall in stock prices turns out to be permanent, what will happen in the diagram to bring output back to its natural rate? What happens to the price level in the long run in this case?

Economics 132.03

Principles of Macroeconomics

Spring 2009

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Solutions to Final Exam

This exam has 12 questions on 5 pages; before you begin, please check to make sure your copy has all 12 questions and all 5 pages. Each of the 12 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. Macroeconomists sometimes think about the determinants of a nation's standard of living with the help of an "aggregate production function" such as

$$Y = AF(L,K,H,N),$$

where Y denotes real GDP, L the number of workers, K the stock of physical capital, H the stock of human capital, N the stock of natural resources, and A the stock of technological knowledge.

a. What does it mean to say that holding the stock of technological knowledge fixed, the aggregate production function has the property of constant returns to scale?

Constant returns to scale means that holding A fixed, doubling L, K, H, and N leads to a doubling of output. Mathematically,

$$\mathbf{2Y = AF(2L,2K,2H,2N)}$$

or, more generally, for any multiple or fraction x,

$$\mathbf{xY = AF(xL,xK,xH,xN).}$$

b. Assuming that this aggregate production function has this property of constant returns to scale, rewrite the equation from above as one that shows how productivity (output per worker) depends on four determinants: physical capital per worker, human capital per worker, natural resources per worker, and the stock of technological knowledge.

Choosing x = 1/L in the last expression from above:

Y/L = AF(1,K/L,H/L,N/L).

c. The British economist Thomas Robert Malthus (1766-1834) famously predicted that because natural resources are limited, population growth would inevitably lead to declining standards of living, perhaps to the point that societies are doomed to suffer from chronic poverty. Explain *briefly* (no more than a sentence or two), how Malthus' reasoning is reflected in your equation from part (b) above.

Malthus' idea was that with limited natural resources N, an increase in L would lead to a reduction in the stock of natural resources per worker, and hence to a lower level of productivity (output per worker).

d. Thankfully, Malthus' prediction has proven to be far too pessimistic; instead of declining towards poverty, living standards in many countries around the world have grown enormously over the past 200 years. According to your equation from part (b) above, what economic factors allow for rising productivity and living standards, even as supplies of natural resources dwindle over time?

Malthus underestimated the possibility that increases in the stock of technological knowledge or in the stocks of physical and human capital per worker would more than offset dwindling supplies of natural resources.

2. In 1980, the nominal interest rate in the US economy was 10 percent and the inflation rate was 8 percent. In 1990, the nominal interest rate was 7 percent and the inflation rate was 3 percent.

   a. Assuming that the nominal interest rates quoted above apply to both borrowing and saving, during which year was it more costly in real terms to borrow: 1980 or 1990?

In 1990, because the real interest rate was 4 percent.

   b. During which year was it more rewarding in real terms to save: 1980 or 1990?

Also in 1990, because the real interest rate was 4 percent.

3. During the first three months of 2009, the number of American workers counted by the Bureau of Labor Statistics as being employed decreased by 2,451,000 (that is, by almost 2 1/2 million) yet, over the same period, the number of American workers counted by the BLS as being unemployed increased by only 2,053,000 (that is, by just a little more than 2 million).

   a. Explain *briefly* (no more than a sentence or two) how these two numbers can be consistent with one another.

Some of the people who are losing their jobs are becoming "discouraged workers," meaning that they are no longer even looking for new jobs. Those workers are counted as being not in the labor force, and therefore neither employed nor unemployed.

b. In light of the two statistics given above, would you say that the rise in the unemployment rate from 7.2 percent to 8.5 percent during the first three months of 2009 overstates or understates the severity of the recession as felt by US workers?

The rise in the unemployment rate understates the severity of the recession, because it does not take into account the increase the number of discouraged workers.

c. If the US labor market begins to recover later this year, which would you expect to be larger in magnitude: the size of the increase in the number of workers who are counted as employed or the size of the decrease in the number of workers who are counted as unemployed?

The increase in the number of workers who are counted as employed, since some discouraged workers will reenter the labor force and be counted as either employed or unemployed, depending on whether or not they find jobs right away. But, either way, the increase in employment will be larger in magnitude than then decrease in unemployment.

4. Consider an economy in which people hold all of their money in the form of deposits and therefore do not hold currency. Suppose that all banks in this economy hold 10% of their deposits as reserves. And suppose that in this economy, the central bank decides to conduct an open market operation in which it purchases $100 in government bonds.

   a. Will this open market operation work to increase or decrease the money supply?

The money supply will increase.

   b. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total amount of reserves have changed?

Since no one holds currency, reserves held by banks will rise by $100.

   c. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total money supply have changed?

With the 10% reserve ratio, the money multiplier is 10, so the total money supply will rise by $100x10, or $1000.

   d. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total amount of deposits have changed?

Since no one holds currency, the entire money supply consists of deposits; deposits, too, will rise by $1000.

e. Once the entire process through which the banking system accepts additional deposits and makes new loans as a result of this open market operations comes to an end, by how much will the total amount of loans have changed?

The banking system as a whole gains $1000 in deposits, and holds 10% or $100 in reserves. It follows that loans increase by $900.

5. Suppose that the Federal Reserve decides to conduct monetary policy by setting a target *Res** for reserves, conducting open market operations to supply *Res** dollars in reserves to the banking system, and then accepting whatever outcome for the federal funds rate works to equate that fixed (inelastic) supply of reserves with banks' demand for reserves.

   a. Draw a supply-and-demand diagram for the market for reserves that shows how the federal funds rate gets determined under this monetary policy strategy.

The diagram should (i) have the federal funds rate on one axis and the quantity of reserves on the other. It should (ii) show a downward-sloping demand curve for reserves and an inelastic (vertical) supply curve for reserves. Finally, it should (iii) show the equilibrium federal funds being determined by the intersection point between the demand and supply curves.

   b. Suppose that the Federal Reserve continues to follow this "reserve targeting" strategy, but decides to conduct another open market operation that increases the fixed supply of reserves from *Res** to a larger amount *Res***. Does this open market operation work to raise the federal funds rate, lower the federal funds rate, or keep the federal funds rate unchanged?

It will lower the federal funds rate.

   c. What happens to the total money supply (currency plus deposits) after this open market operation: does it go up, go down, or stay the same?

The money supply will go up.

6. Suppose that at the beginning of the business day, the First National Bank's balance sheet looks like this:

First National Bank

Assets	**Liabilities**
Reserves $10 Loans $90 Other assets $10	Deposits $100 Shareholder's equity $10

   a. What reserve ratio has the bank chosen?

The reserve ratio is defined as the fraction of the bank's deposits it chooses to hold as reserves. In this case, that ratio is $10/$100 = 1/10 or 0.10 or 10%.

b. If, during the business day, the bank experiences no problems with its loans but experience a $50 deposit outflow, that is, a situation in which the bank's depositors ask to withdraw $50 from their accounts, is the bank "illiquid" or "insolvent?"

The bank is illiquid.

c. Suppose that the bank borrows $45 in the "federal funds market" to cope with this deposit outflow. Is it borrowing from another bank or from the Federal Reserve?

It is borrowing from another bank. If it was borrowing from the Federal Reserve instead, that would be called a "discount loan."

d. Draw a diagram similar to the one above that shows what the bank's balance sheet looks like after it has experienced the $50 deposit outflow as in part (b) and borrowed $45 as in part (c).

First National Bank

Assets	**Liabilities**
Reserves $5	Deposits $50
Loans $90	Borrowings $45
Other assets $10	Shareholder's equity $10

7. This question asks you to use microeconomic supply and demand analysis applied to the market for money to consider the long-run effects of a **decrease** in the money supply.

a. To begin, draw a diagram with the quantity of money measured in dollars on the x-axis and the "goods price of money" measured as 1/P, where P is the economy-wide price level, on the y-axis. Then draw in a demand curve for money.

The demand curve should slope downward.

b. Assuming for simplicity that the Federal Reserve is able to fix the money supply at some initial level M*, draw in the supply curve for money.

The supply curve should be vertical (inelastic).

c. Show what happens in the graph when the Federal Reserve acts to decrease the money supply to a new, lower level M**.

The supply curve shifts to the left.

d. What happens to the price level P as a result of this decrease in the money supply?

The goods price of money 1/P rises, so the price level P falls.

8. Suppose that the money supply is $100, the velocity of money is 4, and real GDP is 200.

    a. What is nominal GDP?

Nominal GDP can be determined by calculating the total volume of spending, equal to the money supply times the velocity of money: $100x4 = $400.

    b. What is the price level (the GDP deflator)?

The price level can be determined by taking nominal GDP and dividing it by real GDP: $400/200 = $2.

    c. Assuming that the velocity of money is constant, what will nominal GDP equal if the Fed acts to increase the money supply to $200?

Nominal GDP will equal the new money supply times the velocity of money: $200x4 = $800.

    d. Assuming that the velocity of money is constant and "money is neutral in the long run," what will real GDP equal in the long run if the Fed acts to increase the money supply to $200?

Real GDP will stay unchanged at 200.

    e. Still assuming that the velocity of money is constant and that money is neutral in the long run, what will the price level equal in the long run if the Fed acts to increase the money supply to $200?

The price level can be determined by taking the new figure for nominal GDP and dividing it by the unchanged value of real GDP: $800/200 = 4.

9. Suppose that two countries have before-tax real interest rates, inflation rates, and tax rates on nominal interest income as follows:

Country	**A**	**B**
Before-tax real interest rate	4%	4%
Inflation rate	0%	4%
Tax rate on nominal interest income	50%	50%

    a. Find the before-tax nominal interest rates in countries A and B.

Before-tax nominal interest rates can be found by adding the before-tax real interest rates to the inflation rates: 4+0 = 4% in country A and 4+4 = 8% in country B.

b. Find the after-tax nominal interest rates in countries A and B.

Since the tax rate on nominal interest income is 50% in both countries, the after-tax nominal interest rates are 2% in country A and 4% in country B.

c. Find the after-tax real interest rates in countries A and B.

The after-tax real interest rates can be found by subtracting the inflation rates from the after-tax nominal interest rates: 2-0 = 2% in country A and 4-4 = 0% in country B.

d. Notice that both countries have the same before-tax real interest rates and the same tax rates on nominal interest income. In which country are the incentives (rewards) for private saving stronger: country A with low inflation or country B with high inflation?

Since the after-tax real interest rate is what really matters for saving, and since country A has the higher after-tax real interest rate, then the incentives for saving are stronger in country A.

10. For each part of this question, please indicate whether the fact mentioned helps explain why, in the aggregate demand/aggregate supply diagram: (i) the aggregate demand curve slopes down, (ii) the long-run aggregate supply curve is vertical, or (iii) the short-run aggregate supply curve slopes up.

    a. Firms and workers negotiate wages based on their price expectations, then those wages remain “sticky” for a period of time.

Explains why the SRAS curve slopes up.

b. Money is neutral in the long run.

Explains why the LRAS curve is vertical.

c. Some firms set their individual prices based on their expectations of the prices of all goods and services that they think will prevail economywide, then those prices remain “sticky” for a period of time.

Explains why the SRAS curve slopes up.

d. When the real value of monetary wealth rises, some consumers buy more goods and services.

Explains why the AD curve slopes down.

e. When the real value of monetary wealth rises, other consumers buy more bonds.

Explains why the AD curve slopes down.

11. For each part of this question, please indicate whether the event works initially (that is, in the short run) in the aggregate demand/aggregate supply diagram to shift the (i) aggregate demand curve, (ii) the long-run aggregate supply curve, or (iii) the short-run aggregate supply curve.

    a. Expectations of future inflation rise, so that employers have to pay higher wages.

Shifts the SRAS curve.

    b. Housing prices rise rapidly, as they did in the US during the first half of the current decade.

Shifts the AD curve.

    c. The Federal Reserve lowers its target for the federal funds rate.

Shifts the AD curve.

    d. Business owners become less confident about future prospects for the US economy.

Shifts the AD curve.

    e. The US Congress and President pass a "stimulus package" that calls for large increases in government purchases.

Shifts the AD curve.

12. Suppose that the economy starts in a long-run equilibrium.

    a. Draw the aggregate demand/aggregate supply diagram to illustrate this initial state of the economy, showing the aggregate demand curve together with both the short-run and the long-run aggregate supply curves.

(i) The aggregate demand curve should slope down, (ii) the short-run aggregate supply curve should slope up, (iii) the long-run aggregate supply curve should be vertical, and (iv) all three curves should intersect at the point at which output Y equals its natural rate Y*.

    b. Now suppose that stock prices fall sharply, as they have in the US over the past year. Use the diagram to show what happens to output and the price level in the short run.

(i) The aggregate demand curve shifts to the left, (ii) output falls below the natural rate, and (iii) the price level falls below its initial level.

    c. Suppose that there are no changes in monetary or fiscal policy. If the decline in the stock market turns out to be only temporary, so that equity prices soon return to their previous levels, what will happen in the diagram to bring output back to its natural rate? What happens to the price level in the long run as a result?

(i) The aggregate demand curve shifts back to its original position so that output and (ii) the price level return to their original levels.

d. If there are no changes in monetary or fiscal policy, but the fall in stock prices turns out to be permanent, what will happen in the diagram to bring output back to its natural rate? What happens to the price level in this case?

(i) The expected price level will fall, shifting the short-run aggregate supple curve to the right, and (ii) the price level falls still further.