Econ 362, Hanes
First problem set on graphing

1) The graph below depicts a competitive market with an upward-sloping supply curve and a downward-sloping demand curve.

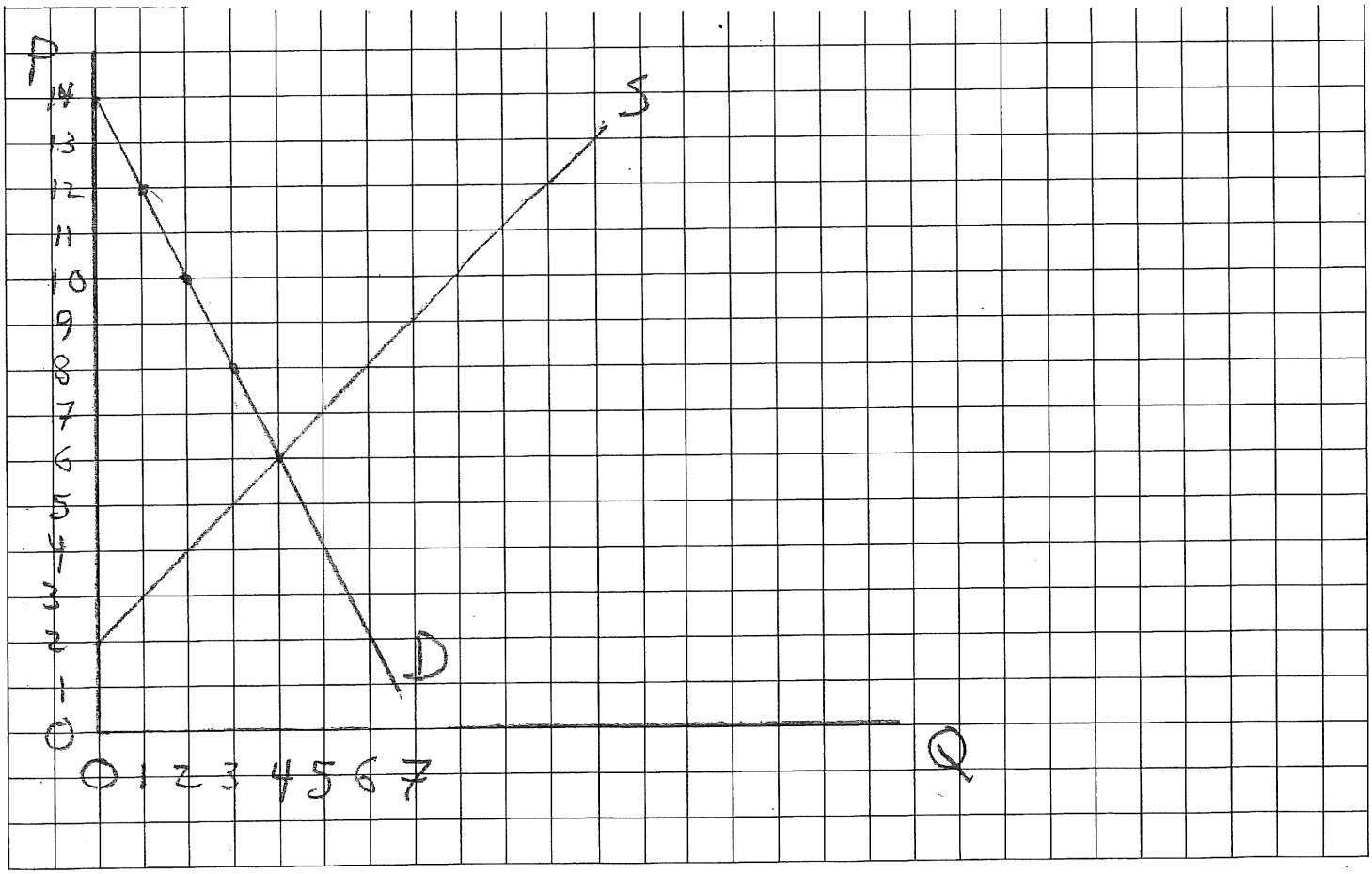
a) What is the equation that is plotted out as the supply curve? $P =$ _____ + _____Q^S

b) What is the equation that is plotted out as the demand curve? $P =$ _____ - _____Q^D

c) The equilibrium price P^* is the price that makes $Q^S = Q^D$. What is P^*? _____

d) Rearrange your answer to a) to get the "supply equation." The supply equation is an equation that gives the quantity supplied as a function of the price.
$Q^S =$ _____ + _____P (Note: the constant in this equation might be a negative number.)

e) Rearrange your answer to b) to get the "demand equation." The demand equation is an equation that gives the quantity demanded as a function of the price.
$Q^D =$ _____ - _____P (Note: the constant in this equation might be a negative number.)



2) Now I ask you to reverse the process. Consider a competitive market with a supply curve given by the equation $Q^S = -2 + \frac{1}{2}P$ and a demand curve given by the equation $Q^D = 4 - \frac{1}{4}P$.

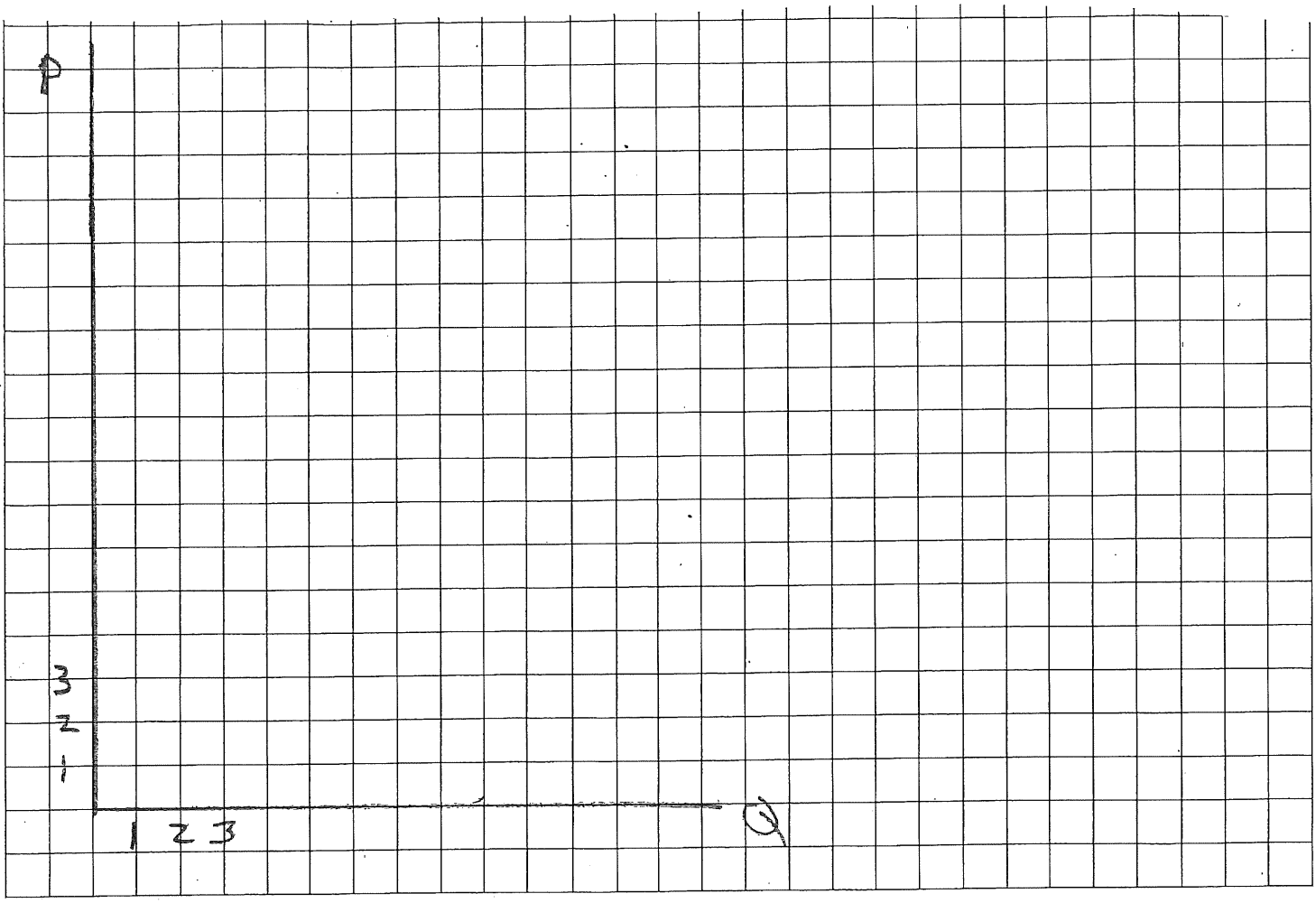
a) Rearrange the supply equation to get the equation that is plotted out as the supply curve.

$P =$ _____ + _____ Q^S Plot this curve on the graph below.

b) Rearrange the demand equation to get the equation that is plotted out as the demand curve.

$P =$ _____ - _____ Q^D Plot this curve on the graph below.

c) From the graph, what is the equilibrium price P^*? _____



d) You can get the equilibrium price without plotting out the supply and demand curves, using the supply equation and the demand equation. P^* is the value for P that makes Q^S in the supply equation equal to Q^D in the demand equation. That is, P^* is the value for P for which: $-2 + \frac{1}{2}P = Q^S = Q^D = 4 - \frac{1}{4}P$ which means $-2 + \frac{1}{2}P^* = 4 - \frac{1}{4}P^*$.

In the space below, use algebra to find the value for P^* that solves $-2 + \frac{1}{2}P^* = 4 - \frac{1}{4}P^*$. Show all the steps in your math.

3) Let's go back to the notion of a demand equation. As before let Q^D denote the quantity demanded of a good, and P denote the price of that good. Recall that the price of a good is not the only thing that affects quantity demanded. The quantity demanded for a good can also be affected by potential buyers' incomes, and by prices of *other* goods. Let I denote the total income of potential buyers of a good, and $\overline{P}$ denote the price of another good. Using these symbols, and equation that describes quantity demanded is:

$Q^D =$ _____ - _____ P + _____ $\overline{P}$ + _____ I

where the numbers that go in front of $\overline{P}$ and I might be positive or negative.

a) If the other good (with price $\overline{P}$) is a "substitute" for the first good, is the number that goes in front of $\overline{P}$ in the demand equation positive or negative? _____

b) If the other good (with price $\overline{P}$) is a "complement" for the first good, is the number that goes in front of $\overline{P}$ in the demand equation positive or negative? _____

c) Now consider the number that goes in front of income I. If the good with price P is a "normal" good, is the number that goes in front of I in the demand equation positive or negative? _____

d) If the good with price P is an "inferior" good, is the number that goes in front of I in the demand equation positive or negative? _____

Econ 362, Hanes
Second problem set on graphing

1) Consider a demand equation for a "normal" good. Q^D is the quantity demanded of the good. P is the price of the good. I is the total income of potential buyers of the good.

$$Q^D = 10 - \frac{1}{2}P + 2I$$

a) Suppose $I = 5$. Enter that into the above equation and rearrange to get the equation that is plotted out as the demand curve.

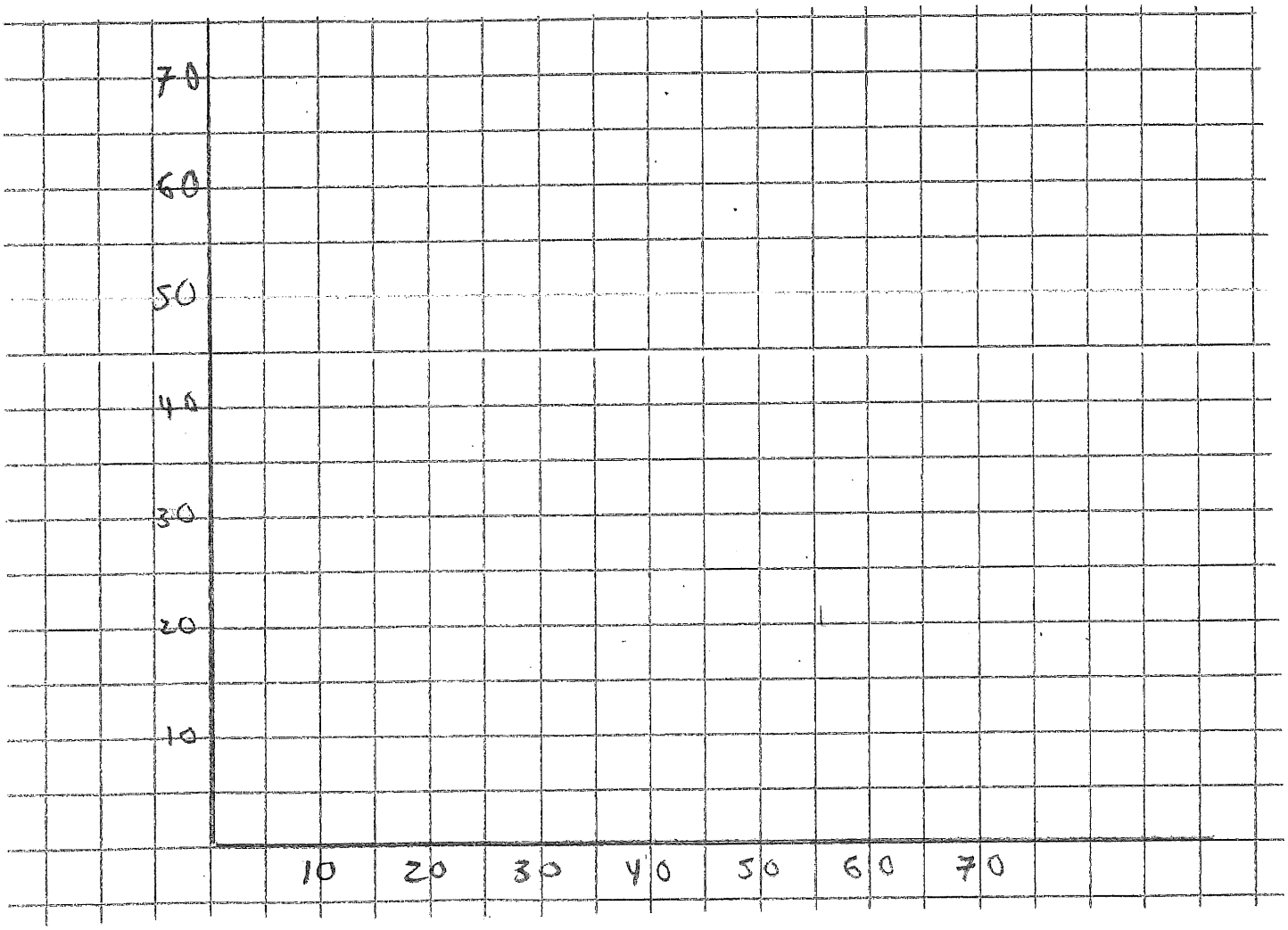
$P =$ _____ - _____Q^D Plot this curve on the graph below. Label the curve "D_a"

b) Now suppose $I = 10$. Enter *that* and rearrange to get the equation that is plotted out as the demand curve.

$P =$ _____ - _____Q^D Plot this curve on the same graph below. Label the curve "D_b"

c) Draw an upward-sloping supply curve on the graph below, anywhere you like. Label the curve "S."

d) Consider the equilibrium price P^* that makes $Q^S = Q^D$. Does an increase in income I raise the equilibrium price, lower it, or have no effect on it? _____



MORE ON NEXT PAGE

2) Now consider another demand equation with a constant (like *10* in the demand equation above), a coefficient on P (like *-1/2* in the demand equation above), and a coefficient on I (like *2* in the equation above). But now I don't want to be specific about the values of the constant and the coefficients. So I just write:

$$Q^D = a - bP + cI$$

I also don't want to be specific about the value of I.

a) Rearrange the demand equation to get the equation that is plotted out as the demand curve.

_____

b) Imagine plotting this demand curve. What would the intercept be? Note: your answer is not going to be a number. It's going to be a collection of letters.

_____

What would the slope be? Again, your answer is not going to be a number. _____

c) What would happen to the demand curve if income I gets bigger? Does the demand curve shift up (often called "out"), or down (often called "back"), or stay in the same position? _____

3) Take the same demand equation $Q^D = a - bP + cI$. Combine it with a supply equation written in the same vague way:

$$Q^S = d + eP$$

a) Using the supply equation together with the demand equation, solve for the equilibrium price P^*. Your answer is going to be a collection of letters.

$P^* =$ _____

b) What does your answer to b) imply about the relationship between income I and the equilibrium price P^*? That is, does an increase in income tend to raise P^* or lower P^*? _____

Explain how your answer to b) tells you that.

c) Suppose income increases by exactly one unit, like from *10* to *11* or from *5* to *6*. What is the resulting change in P^*, exactly, in terms of the letters?

Economics 362 Macroeconomic Theory Hanes Problem set on Macroeconomic Statistics

1) Look at these numbers.

Category	Number of people (millions)
People employed	5
People working in their own businesses	3
Full-time students	1
Retired people	2
People not employed, working, students or retired,	
actively looking for work	2
not actively looking for work	1

What is the size of the "labor force," in millions? _____

What is the unemployment rate, in percent? _____

2) There are four industries in the country of Kafiristan: stick-gathering, tomato-growing, basket-weaving and cutlery (knife-making). Tomatos and baskets are sold to households. Knives, which last a long time, are not sold to households; they are sold to tomato-farmers, basket-weavers and stick-gatherers, who all use knives in their businesses. Sticks, which are woven together to make baskets, are sold only to basket-weavers. Kafiris own land in the neighboring country of Kalashistan. Kalashis own all of the basket-weaving firms in Kafiristan.

a) Fill out the missing items in the following table.

	Total revenue	Cost of labor	Cost of knives	Cost of sticks	Value-added
Tomato farms	14	7	1	0	_____
Stick-gathering	6	5	1	0	_____
Basket-weaving	12	3	1	6	_____
Cutlery	3	3	0	0	_____

Profit of basketweaving firms: 2

Rent on land owned by Karifis in Kalashistan: 1

GDP of Kafiristan: _____

GNP of Kafiristan: _____

b) 5 pts. Which items' prices would be included in a CPI for Kafiristan?

List the items: _____

c) 5 pts. Which items' prices would be included in a GDP price index for Kafiristan?

List the items: _____

3) Fill out the missing numbers in the table below. You will need to use a calculator or Excel.

Year	Percent change in real GDP from previous year	Nominal GDP	Real GDP quantity index, base year 1915 equals 100	Chained (1915) dollar real GDP index
1914	3	121	_____	_____
1915	5	125	_____	_____
1916	-2	120	_____	_____

Econ 362 Hanes **Problem set on Z method to test for constant returns to scale**

Using the Z method, *show* whether each of these production functions does or does not have constant returns to scale. Be sure to put the question mark above the "equals sign" until you get to the bottom line. like this: $\overset{?}{=}$

If your answer is "yes, it does have constant returns," make sure that the bottom-line equation is *exactly the same* on the left- and right-hand sides.
If your answer is "no, it does not have constant returns, make sure to *circle* the parts of the the left- and right-hand sides that are *different.*

A) $Y = 10 + K^{1/2}L^{1/2}$ Does it have constant returns? _____ (yes or no)

B) $Y = K^{1/3}L^{2}$ Does it have constant returns? _____ (yes or no)

Econ 362 Intermediate Macro (Hanes)
Growth Accounting Assignment

The following pages give data from the BLS and BEA on real GDP, capital stock, and employment in the nonfarm business sector in 1948 and 2002.

Use the data to calculate average annual growth in total factor productivity in the nonfarm business sector over that span of time, as in Mankiw's Table 10-1 (11th edition) 9-2 (10th edition). Your result will not match Mankiw's numbers exactly.

Assume α is equal to 0.30.

Something you need to know: the average annual growth rate from 1948 to 2002 for a variable that has a value of *X1948* in the year 1948, and a value of *X2002* in the year 2002, is:

$$100 \cdot \left(\sqrt[54]{\frac{X2002}{X1948}} - 1 \right)$$

In Excel, this is (X2002/X1948)^(1/54)

this means "take the 54th root"

Bureau of Economic Analysis
National Income and Product Accounts Table

Table 1.3.3. Real Gross Value Added by Sector, Quantity Indexes

[Index numbers, 2000=100]

Today is: 2/12/2007 Last Revised on January 31, 2007 Next Release Date February 28, 2007

Line		1948
1	**Gross domestic product**	**16.738**
2	**Business** [1]	**15.318**
3	Nonfarm[2]	14.873
4	Farm	26.911
5	**Households and institutions**	**12.203**
6	Households	12.630
7	Nonprofit institutions serving households[3]	12.098
8	**General government** [4]	**33.805**
9	Federal	69.674
10	State and local	19.001
	Addendum:	
11	Gross housing value added	12.383

year

Bureau of Economic Analysis
National Income and Product Accounts Table

Table 1.3.3. Real Gross Value Added by Sector, Quantity Indexes

[Index numbers, 2000=100]

Today is: 2/12/2007 Last Revised on January 31, 2007 Next Release Date February 28, 2007

Line		2002
1	**Gross domestic product**	**102.362**
2	**Business** [1]	**101.829**
3	Nonfarm[2]	101.867
4	Farm	98.001
5	**Households and institutions**	**104.643**
6	Households	103.019
7	Nonprofit institutions serving households[3]	106.786
8	**General government** [4]	**103.819**
9	Federal	102.518
10	State and local	104.360
	Addendum:	
11	Gross housing value added	101.848

YEAR

Bureau of Economic Analysis
Fixed Assets Table

Table 1.2. Chain-Type Quantity Indexes for Net Stock of Fixed Assets and Consumer Durable Goods

[Index numbers, 2000=100]

Today is: 2/12/2007 Last Revised on August 15, 2006

year

Line		1948
1	**Fixed assets and consumer durable goods**	**18.760**
2	**Fixed assets**	**21.141**
3	Private	19.156
4	Nonresidential	17.886
5	Equipment and software	10.036
6	Structures	24.898
7	Residential	20.595
8	Government	28.630
9	Nonresidential	29.081
10	Equipment and software	39.614
11	Structures	26.386
12	Residential	16.669
13	**Consumer durable goods**	**6.359**
	Addenda:	
14	**Private and government fixed assets**	**21.141**
15	Nonresidential	21.546
16	Equipment and software	14.264
17	Structures	25.567
18	Residential	20.522
19	**Government fixed assets**	**28.630**
20	Federal	60.292
21	State and local	17.586

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Bureau of Economic Analysis
Fixed Assets Table

Table 1.2. Chain-Type Quantity Indexes for Net Stock of Fixed Assets and Consumer Durable Goods

[Index numbers, 2000=100]

Today is: 2/12/2007 Last Revised on August 15, 2006

Line		2002
1	**Fixed assets and consumer durable goods**	**105.624**
2	**Fixed assets**	**104.760**
3	Private	104.892
4	Nonresidential	104.229
5	Equipment and software	105.998
6	Structures	103.139
7	Residential	105.531
8	Government	104.266
9	Nonresidential	104.322
10	Equipment and software	102.917
11	Structures	104.523
12	Residential	102.990
13	**Consumer durable goods**	**113.563**
	Addenda:	
14	**Private and government fixed assets**	**104.760**
15	Nonresidential	104.261
16	Equipment and software	105.547
17	Structures	103.726
18	Residential	105.477
19	**Government fixed assets**	**104.266**
20	Federal	99.358
21	State and local	105.886

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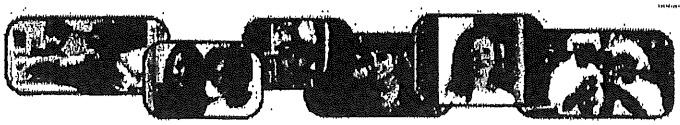
U.S. Department of Labor
Bureau of Labor Statistics
Bureau of Labor Statistics Data



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☐ include graphs **NEW!** More Formatting Options ➡

Data extracted on: February 12, 2007 (5:28:03 PM)

Employment, Hours, and Earnings from the Current Employment Statistics survey (National)

Series Id: CES0500000001
Seasonally Adjusted
Super Sector: Total private
Industry: Total private
NAICS Code: N/A
Data Type: ALL EMPLOYEES, THOUSANDS

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annı
1948	39062	38922	39057	38726	39114	39296	39386	39384	39489	39421	39325	39140	

year

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Postal Square Building
2 Massachusetts Ave., NE
Washington, DC 20212-0001

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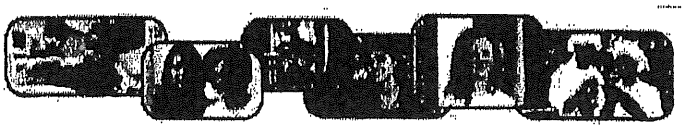
Do you have a **Technical (web) question**?
Do you have **Other comments**?

U.S. Department of Labor
Bureau of Labor Statistics
Bureau of Labor Statistics Data



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Change Output Options: From: 2002 To: 2002 GO

include graphs NEW!

More Formatting Options

Data extracted on: February 12, 2007 (5:28:38 PM)

Employment, Hours, and Earnings from the Current Employment Statistics survey (Nat

Series Id: CES0500000001
Seasonally Adjusted
Super Sector: Total private
Industry: Total private
NAICS Code: N/A
Data Type: ALL EMPLOYEES, THOUSANDS

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
2002	109217	109086	108999	108904	108810	108822	108746	108686	108660	108765	10875

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2 Massachusetts Ave., NE
Washington, DC 20212-0001

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SUNY-Binghamton

Economics 362, Hanes
Intermediate macroeconomics
Problem set

You are the owner of a manufacturing plant in Endicott. Your plant makes rubber soles for sneakers. You are considering a possible expansion of the plant. The expansion would allow you to produce shoelaces too.

In order to produce the shoelaces, you must spend **$1,000** right now to purchase shoelace-making machinery. The machinery will be installed and ready to go a year from now. At that time, in order to make the shoelaces, you must hire **4** workers and pay them whatever is the prevailing wage a year from now. The workers and the machines will produce **100** cases of shoelaces. You will sell the shoelaces at whatever is the prevailing price of shoelaces a year from now. You know the current wage is **$10**, and the current selling price of a case of shoelaces is **$1**. But you must guess what wages and prices will be a year from now, when it is time to make the shoelaces. Your operating profit will be:

$$(P_{NextYear}^{SHOELACES} * 100) - (W_{NextYear}^{SHOELACEWORKERS} * 4)$$

Also, you will be able to sell the machinery for $P_{NextYear}^{MACHINE}$. You guess that wages and prices one year from now will be a certain percent higher than they are now. Your guess at this increase in wages and prices is the expected inflation rate π^e .

To finance the expenditure of $1,000 for the machinery, you can borrow from your bank. The annual rate of interest on a bank loan is i. So if you borrow the money, at the end of the year, when you are producing and selling your batch of shoelaces, you must give the bank:

$$\$1{,}000*(1+i)$$

Will this deal make you money? That is, will it be true that:

$$P_{NextYear}^{MACHINE} + (P_{NextYear}^{SHOELACES} * 100) - (W_{NextYear}^{SHOELACEWORKERS} * 4) > \$1{,}000*(1+i)$$

If it is, you will make money by making the investment in shoelace machinery. If it isn't, the investment will lose money, and you shouldn't do it.

Now consider the following cases (see other side).

1) Case 1. Interest rate i is 5%

Expected inflation is 2% (you expect wages and prices to be 2% higher at the end of the year than they are now.)

Calculate and fill in the following numbers.

What you must pay bank = $\$1{,}000 * (1+i) = \$$_____

$P_{NextYear}^{MACHINE} = \$1000 * (1 + \pi^e) = \$$_____

$P_{NextYear}^{SHOELACES} = \$1 * (1 + \pi^e) = \$$_____

$W_{NextYear}^{SHOELACEWORKERS} = \$10 * (1 + \pi^e) = \$$_____

$P_{NextYear}^{MACHINE} + (P_{NextYear}^{SHOELACES} * 100) - (W_{NextYear}^{SHOELACEWORKERS} * 4) = \$$_____

Should you make the investment? Yes or no? _____

What is the real interest rate? _____

2) Case 1. Interest rate i = 10%

Expected inflation = 2% (you expect wages and prices to be 2% higher at the end of the year than they are now.)

Calculate and fill in the following numbers.

What you must pay bank = $\$$_____

$P_{NextYear}^{MACHINE} = \$$_____

$P_{NextYear}^{SHOELACES} = \$$_____

$W_{NextYear}^{SHOELACEWORKERS} = \$$_____

$P_{NextYear}^{MACHINE} + (P_{NextYear}^{SHOELACES} * 100) - (W_{NextYear}^{SHOELACEWORKERS} * 4) = \$$_____

Should you make the investment? Yes or no? _____

What is the real interest rate? _____

3) Case 1. Interest rate i = 10%

Expected inflation = 7% (you expect wages and prices to be 7% higher at the end of the year than they are now.)

Calculate and fill in the following numbers.

What you must pay bank = $_____

$P_{NextYear}^{MACHINE}$ = $_____

$P_{NextYear}^{SHOELACES}$ = $_____

$W_{NextYear}^{SHOELACEWORKERS}$ = $_____

$P_{NextYear}^{MACHINE} + (P_{NextYear}^{SHOELACES} * 100) - (W_{NextYear}^{SHOELACEWORKERS} * 4)$ = $_____

Should you make the investment? Yes or no? _____

What is the real interest rate? _____

Economics 362, Hanes
Problem set on the natural rate of interest and loanable funds

1) Consider a "closed economy" in which

$$Y = C + I + G$$
$$C = a + b(Y - T)$$
$$I = c - dr$$
$$G = \overline{G}$$
$$T = tY \text{ where } 0 < t < 1$$

Notice that this economy is a little different from the one we described in class. Here, taxes net of transfers T is not an exogenous variable. T is instead a fraction of real GDP, such as $\frac{1}{10}$ or $\frac{1}{5}$, denoted t.

a) Using algebra, derive the equation that gives the natural rate of interest $\overline{r}$ as a function of $\overline{G}$, $\overline{T}$, and $\overline{Y}$.

b) Using algebra, derive the equation that gives national savings S when output is equal to the natural rate of output $\overline{Y}$. (We called this $\overline{S}$.)

2) Continue to consider the economy from part 1). On the "loanable funds" graphs below, draw what happens to the natural rate of interest in response to the events listed. Hint: use your answer from 1b)!

a) Exogenous government purchases $\overline{G}$ decreases from a higher value $\overline{G}_1$ to a lower value $\overline{G}_2$.

b) The "tax rate" t decreases from a higher value t_1 to a lower value t_2.

c) The constant in the consumption function a increases from a higher value a_1 to a lower value a_2.

Econ 362, Macroeconomic Theory
Problem set on model of small open economy in the long run
Suppose Taiwan can be described by our model of a small open economy in the long run. Depict each event listed below on two graphs. On the left-hand side graph, show what happens to Taiwan's national saving and investment. On the right-hand side graph, show what happens to Taiwan's real exchange rate. For each event, assume everything I did not mention remains fixed. Label the "before" lines or variables with a subscript "0" (e.g. X_0). Label the "after" lines or variables with a subscript "1" (e.g. X_1). State whether Taiwanese net exports increase, decrease, or don't change. State whether the Taiwanese real exchange rate increases, decreases, or doesn't change.
Assume that before each event, NX=0.
1) There is an increase in the world real interest rate r^*.

Net exports: _____ Real exchange rate: _____

2) There is an increase in Taiwanese government spending on goods and services, with no change in Taiwanese taxes.

Net exports: _____ Real exchange rate: _____

3) A useful new kind of capital equipment becomes available in Taiwan, so that Taiwanese firms would want to engage in more investment spending at any given real interest rate.

Net exports: _____ Real exchange rate: _____

4) Foreign demand for Taiwanese products increases, so that Taiwanese exports would be greater at any given real exchange rate.

Net exports: _____ Real exchange rate: _____

Econ 362, Macroeconomic Theory

Problem set on job finding, job separation and the equilibrium unemployment rate.

As in the model presented in class,
U is the total number of unemployed people.
E is the total number of employed people.
The labor force $L = U + E$. The number of people in the labor force is fixed.
The unemployment rate is $u = U/L$.
The number of people losing jobs in a period is sE where s is a fraction (between zero and one).

Unlike the model presented in class,
the number of unemployed people finding jobs in a period is $fU - gE$ where f and g are both fractions (between zero and one).

Derive the long-run equilibrium value of the unemployment rate u. Show your work!

Economics 362, Macroeconomic Theory
Problem set on Solow Model
You might want to use a calculator for this problem set.

1) Suppose an economy's aggregate production function is $Y=K^{1/4}L^{3/4}$, its savings rate s is three-tenths (people save three tenths of their income), and its depreciation rate is ten percent per year (one-tenth of the capital stock disappears each year through depreciation). The population (labor force) is stable, not growing.

a) What is the "per-worker" production function that relates output per worker y to capital per worker k?

b) Find k^*, the long-run steady state value of k.

2) Suppose the savings rate rises to one-half. What is the new value of k^*?

3) Using a graph that has k on the horizontal axis and y on the vertical axis, show what happens in the *short run* and in the *long run* when the savings rate rises from three-tenths to one-half.

4) In words, describe what happens to k over this transition, and what happens to y. Be clear. Use full sentences.

Economics 362, Intermediate Macro, Hanes
Second problem set on Solow Model

Consider an economy with a rate of population growth n, a depreciation rate δ, and a savings rate s. (n, δ, and s are all fractions.)
The aggregate production function is: $Y = K^{1/3}L^{2/3}$

1) Use algebra to get the "per worker production function" $y=f(k)$

2) Write an equation that gives the change in capital per worker Δk as a function of k, n, δ, and s.

3) In the long-run steady state, $\Delta k=0$. Using this fact and your answer to b), use algebra to get an equation that gives the LRSS value of capital per worker, denoted k^*, as a function of n, δ, and s.

4) Using your answer to 3), explain what happens to k^* if the savings rate s increases from a low value s_0 to a higher value s_1.

5) In a graph, show what happens to the economy if the savings rate s increases from a low value s_0 to a higher value s_1. In words, explain how you get from the "short run" immediately after the increase in *s* to the "long run" many years after the increase in *s*.

6) With this aggregate production function, the marginal product of capital, which is equal to the slope of the "per worker" production function *f(k)*, is: $\frac{\partial f(k)}{\partial k} = \frac{1}{3}k^{-2/3}$

What is this MPK equal to if the economy is in the "Golden Rule" state?

7) Use algebra to find the Golden Rule value of capital per worker k^*_{gold} as a function of *n* and δ.

8) Draw a graph that shows an economy where the savings rate is *too low* to achieve k^*_{gold}. Make sure that you mark k^*_{gold} on the graph, and draw the graph so that the economy's LRSS consumption per worker *c** is less than the golden rule value c^*_{gold}.

Econ 362 Macroeconomic Theory, Hanes
Problem set on IS curve model and fiscal policy

Name: _____

Section: _____

Consider our standard model of the IS curve and loanable funds. I will refer to *(G - T)* as the "government budget deficit."

1) You know that real GDP Y equals consumption C plus investment I plus government purchases of goods and services G. In general terms, that is:

$$Y = C(Y-T) + I(r) + G$$

Suppose the consumption function is specifically $C = a + b(Y-T)$ and the investment function is $I = c - dr$. Using algebra, make an equation that has Y on the left-hand side and on the right-hand side, G, T and r. This is the big equation we use to talk about the IS curve and what shifts it.

2) Suppose that output Y is too low. You want to increase Y. From the equation you made in 1) or from the IS curve, you can see that one way to increase output is to cut the real interest rate r. But suppose that, for some reason, it is *impossible* to cut the real interest rate. Instead, you have the power to increase G by ten units, or decrease T by ten units. Doing either will increase the government budget deficit G-T by ten units. Which action will have a bigger effect on Y? Hint: remember the "marginal propensity to consume" b is greater than zero, less than one.

3) You know that national saving S equals private saving plus public saving, or private saving minus the government budget deficit. In general terms, that is:

$$S = Y - T - C(Y-T) - (G-T)$$

Again suppose that the consumption function is specifically $C = a + b(Y-T)$ and the investment function is $I = c - dr$. Using algebra, make an equation that has S on the left-hand side and on the right-hand side, G, T and Y.

(continue on next page)

4) Hint: for this question, it may be useful to refer back to your answer to 3). Recall that the pool of private saving $(Y - T) - C$ is divided between investment I and the government budget deficit $(G-T)$. Eugene says that an increase in G cannot possibly increase Y, because any increase in the government budget deficit must be financed out of the pool of private saving, and that must reduce private saving available for investment. Thus, investment falls by the amount of the increase in the government budget deficit, and there is no increase in Y.

a) Suppose output is always equal to the "natural rate of output" $\bar{Y}$.
Using the "loanable funds" graph,
illustrate what happens to investment
if there is an increase in G or
decrease in T, and output is always
equal to $\bar{Y}$

Is Eugene's statement correct in this case? _____ (yes or no)

b) Suppose output need not always equal $\bar{Y}$. Instead, the real interest rate is *held fixed.*
Using the "loanable funds" graph,
illustrate what happens to investment
if there is an increase in G
and the real interest rate
is held fixed. Hint: here it may be
useful to look at your answers
to 1) and 2), too.

Is Eugene's statement correct in this case? _____ (yes or no)

Econ 362, Macroeconomic Theory, Hanes
Problem set on money supply, money demand

Consider an economy where demand for real money balances is $(M/P)^D = eY - fi + \epsilon$. The variable ϵ represents the effect of any special factors, other than real income or the nominal interest rate, that might affect money demand.
The real interest rate is $r = i - E\pi$.
The money supply M^S is determined by the central bank.

1) Derive an equation that gives $(M/P)^D$ as a function of Y, $E\pi$, r and ϵ . In this equation, $(M/P)^D$ should be alone on the left-hand side.

2) Starting from your answer to 1), do some algebra and derive an equation that gives r as a function of $(M/P)^D$, Y, $E\pi$ and ϵ . This is the "equation of the money demand curve."

3) Draw a money supply/demand graph with r on the vertical axis and M/P on the horizontal axis. Show what happens if the price level *increases* from P_0 to P_1 (nothing else changes). Label the "before" real interest rate as r_0 and the "after" real interest rate as r_1 .

4) a) Draw a money supply/demand graph that shows what happens in an economy if the price level increases by *exactly ten percent* and, at exactly the same time, the central bank increases the money supply by exactly ten percent. Label the "before" real interest rate as r_0 and the "after" real interest rate as r_1 .

4) continued
b) Consider your answer to a). In the situation you drew there, was the central bank buying stuff, selling stuff, or neither?

5) Draw a money supply/demand graph that shows what happens in an economy if there is a special factor that tends to increase money demand, that is, if ϵ increases from ϵ_0 to ϵ_1, while nothing else changes. Label the "before" real interest rate as r_0 and the "after" real interest rate as r_1.

6) Suppose the central bank adjusts the money supply every single day so as to keep r equal to a predetermined value r_T (for example, 2 percent).

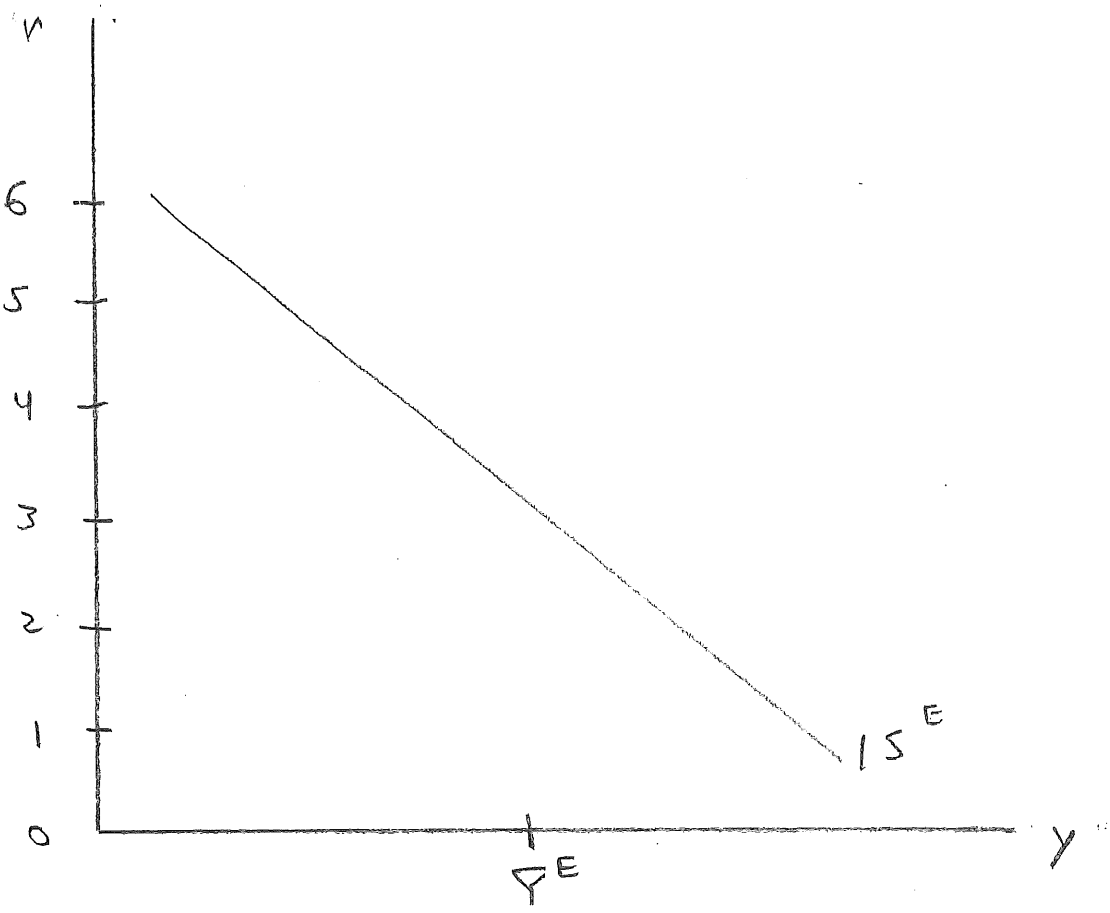
a) Draw a money supply/demand graph that shows what would happen if there is a special factor that tends to increase money demand, that is, ϵ increases from ϵ_0 to ϵ_1, while the central bank always keeps r equal to the predetermined value r_T. Mark r_T on the graph. Assume Y, $E\pi$ and P do not change.

b) Consider your answer to a). In the situation you drew there, was the central bank buying stuff, selling stuff, or neither?

Econ 362, Macroeconomic Theory
Problem set on monetary policy when central bank sets r, not M

For all the following, assume the Federal Reserve's inflation target π^T is 2%. The natural rate of unemployment or NAIRU u^n is 5%. The Fed's policy committee (the FOMC) operates by setting a target for the real interest rate, denoted r^T. Recall that r is what we use to denote a *real* interest rate, such that $r = i - \pi^e$. Thus, r^T denotes a target *real* interest rate.

1) Suppose that surveys show people in the economy expect future inflation to be 2% ($\pi^e = 2$). The Fed's best forecast for the position of the IS curve is plotted below, along with its guess at the natural rate of output (potential output) $\bar{Y}$. On the vertical axis, mark the value the Fed will choose for r^T.

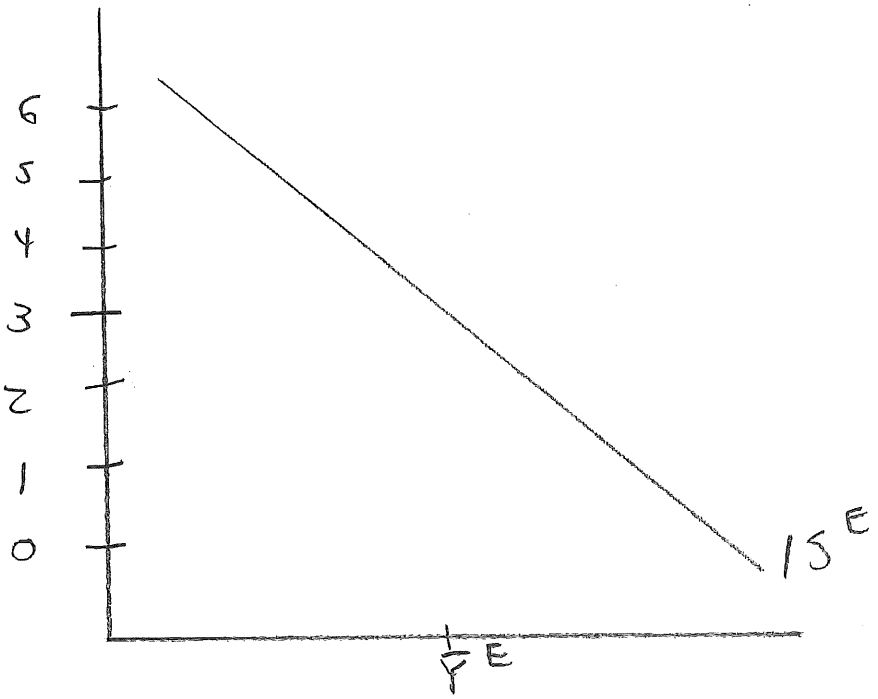


What will the nominal interest rate be? $i =$ _____

If the Fed's forecasts of the IS curve and $\bar{Y}$ turn out to be correct,
will unemployment turn out to be greater than, less than or equal to 5%? _____

will inflation turn out to be greater than, less than or equal to 2%? _____

2) Suppose $\pi^e = 3$. On the vertical axis, mark a value the Fed might choose for r^T.



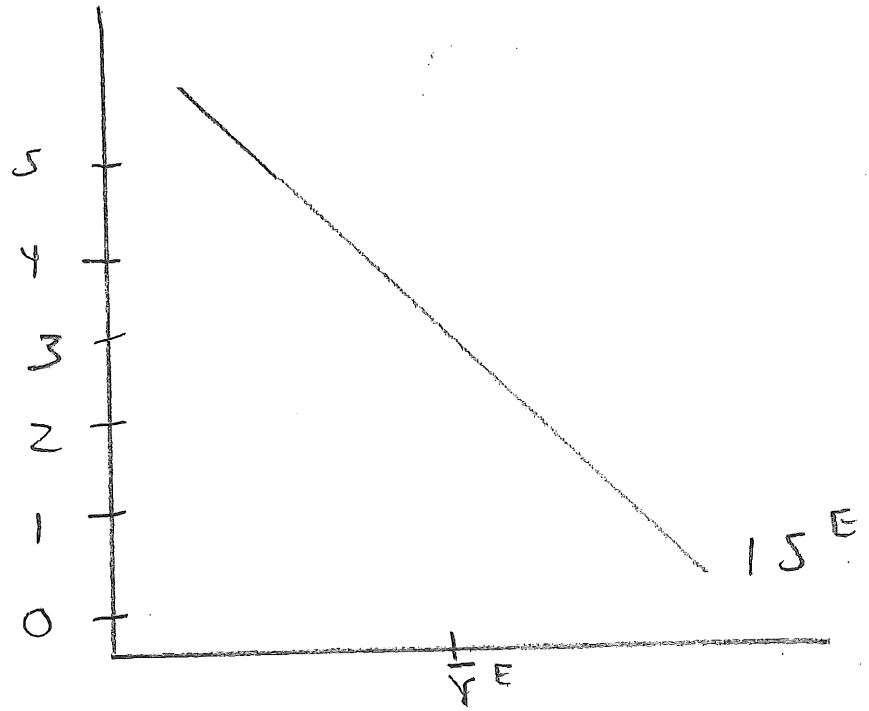
What will the nominal interest rate be? $i =$ _____

If the Fed's forecasts of the IS curve and $\bar{Y}$ turn out to be correct,

will unemployment turn out to be greater than, less than or equal to 5%? _____

will inflation turn out to be greater than, less than or equal to 3%? _____

3) Suppose $\pi^e = 0$. On the vertical axis, mark a value the Fed might choose for r^T.



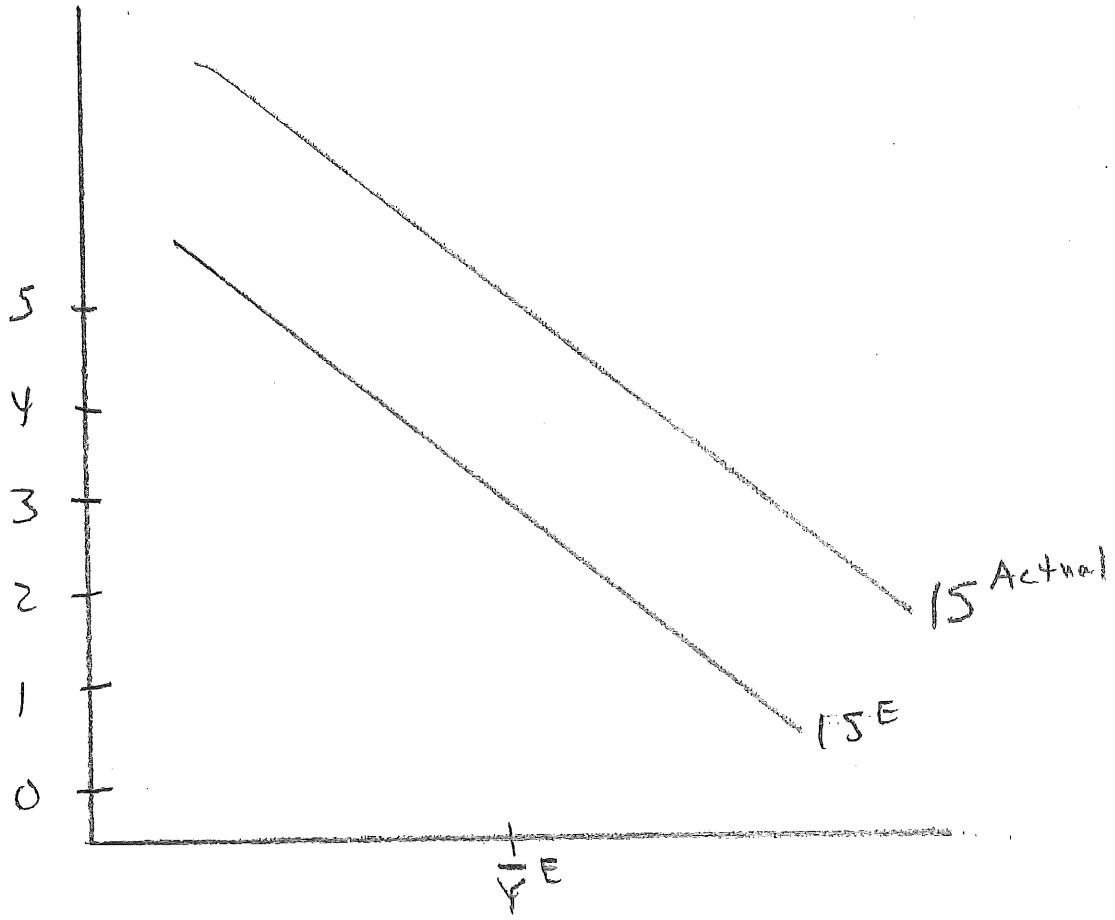
What will the nominal interest rate be? $i =$ _____

If the Fed's forecasts of the IS curve and $\bar{Y}$ turn out to be correct,

will unemployment turn out to be greater than, less than or equal to 5%? _____

will inflation turn out to be greater than, less than or equal to 0%? _____

4) Suppose $\pi^e = 2$. Also suppose the Fed's forecast for $\bar{Y}$ turns out to be correct, but the Fed's forecast for the position of the IS curve turns out to be incorrect as plotted below. On the vertical axis, mark the value the Fed chose for r^T. On the horizontal axis, mark what output will turn out to be.

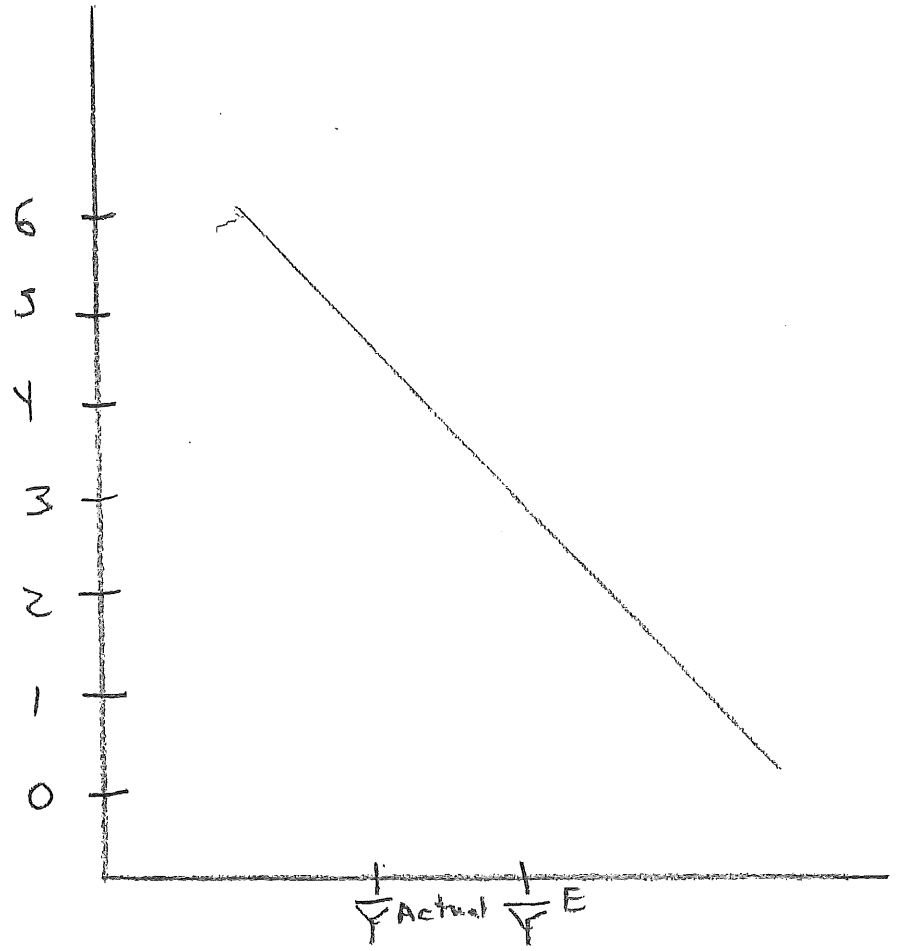


What will the nominal interest rate be? $i =$ _____

Will unemployment turn out to be greater than, less than or equal to 5%? _____

Will inflation turn out to be greater than, less than or equal to 2%? _____

5) Suppose $\pi^e = 2$. Also suppose the Fed's forecast for the position of the IS curve turns out to be correct. But the Fed's forecast for $\bar{Y}$ turns out to be incorrect. The Fed *overestimates* the amount of output the economy can produce when unemployment is 5% (perhaps because the Fed overestimates the rate of improvement in technology). On the vertical axis, mark the value the Fed chose for r^T. On the horizontal axis, mark what output will turn out to be.



What will the nominal interest rate be? $i =$ _____

Will unemployment turn out to be greater than, less than or equal to 5%? _____

Will inflation turn out to be greater than, less than or equal to 2%? _____