

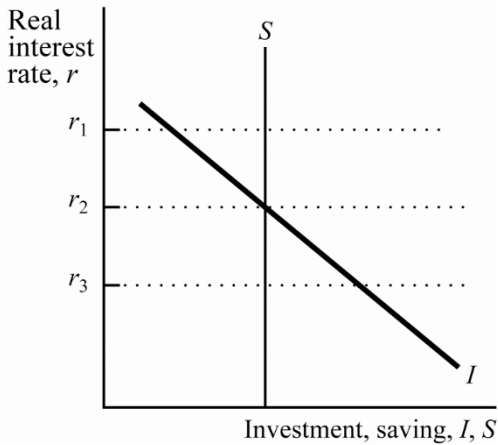
## ECON 3010 Intermediate Macroeconomics Solutions to the Final Exam

### Multiple Choice Questions. (120 points; 3 pts each)

1. A production function is a technological relationship between:
  - A) factor prices and the marginal product of factors.
  - B) factors of production and factor prices.
  - C) factors of production and the quantity of output produced.**
  - D) factor prices and the quantity of output produced.
  
2. The marginal product of labor is:
  - A) output divided by labor input.
  - B) additional output produced when one additional unit of labor is added.**
  - C) additional output produced when one additional unit of labor and one additional unit of capital are added.
  - D) value of additional output when one dollar's worth of additional labor is added.
  
3. An increase in the supply of capital will:
  - A) increase the real rental price of capital.
  - B) decrease the real rental price of capital.**
  - C) increase the productivity of capital.
  - D) decrease the real interest rate.
  
4. If  $Y = AK^{0.5}L^{0.5}$  and  $A$ ,  $K$ , and  $L$  are all 100, the marginal product of capital is:
  - A) 50.**
  - B) 100.
  - C) 200.
  - D) 1000.
  
5. The *real* interest rate is the:
  - A) rate of interest actually paid by consumers.
  - B) rate of interest actually paid by banks.
  - C) rate of inflation minus the nominal interest rate.
  - D) nominal interest rate minus the rate of inflation.**
  
6. When a pizza maker lists the price of a pizza as \$10, this is an example of using money as a:
  - A) store of value.
  - B) unit of account.**
  - C) medium of exchange.
  - D) flow of value.

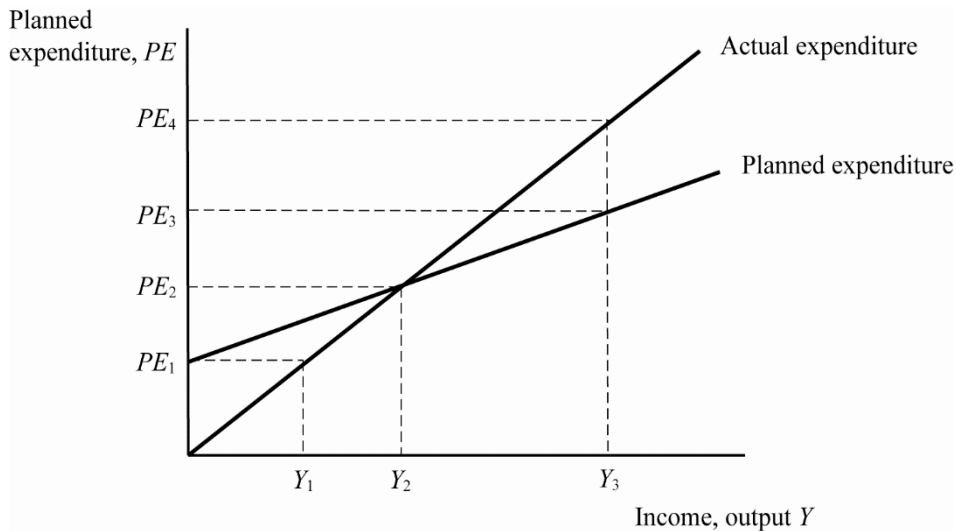
7. The central bank in the United States is the:
- A) Bank of America.
  - B) U.S. Treasury.
  - C) U.S. National Bank.
  - D) Federal Reserve.
8. If there is no currency and the proceeds of all loans are deposited somewhere in the banking system and if  $rr$  denotes the reserve–deposit ratio, then the total money supply is:
- A) reserves divided by  $rr$ .
  - B)  $1/rr$ .
  - C) reserves times  $rr$ .
  - D) reserves divided by  $(1 - rr)$ .
9. If currency held by the public equals \$100 billion, reserves held by banks equal \$50 billion, and bank deposits equal \$500 billion, then the monetary base equals:
- A) \$50 billion.
  - B) \$100 billion.
  - C) \$150 billion.
  - D) \$600 billion.
10. The money supply will increase if the:
- A) currency–deposit ratio increases.
  - B) reserve–deposit ratio increases.
  - C) monetary base increases.
  - D) discount rate increases.
11. The rate of inflation is the:
- A) median level of prices.
  - B) average level of prices.
  - C) percentage change in the level of prices.
  - D) measure of the overall level of prices.
12. According to the quantity theory of money, ultimate control over the rate of inflation in the United States is exercised by:
- A) the Organization of Petroleum Exporting Countries (OPEC).
  - B) the U.S. Treasury.
  - C) the Federal Reserve.
  - D) private citizens.

13. If the money supply increases 12 percent, velocity decreases 4 percent, and the price level increases 5 percent, then the change in real GDP must be \_\_\_\_\_ percent.
- A) 3
  - B) 4
  - C) 9
  - D) 11
14. The costs of reprinting catalogs and price lists because of inflation are called:
- A) menu costs.
  - B) shoeleather costs.
  - C) variable yardstick costs.
  - D) fixed costs.
15. The value of net exports is also the value of:
- A) net investment.
  - B) net saving.
  - C) national saving.
  - D) the excess of national saving over domestic investment.
16. In a small open economy, if domestic saving exceeds domestic investment, then the extra saving will be used to:
- A) make loans to the domestic government.
  - B) make loans to foreigners.
  - C) repay the national debt.
  - D) repay loans to the Federal Reserve.
17. In a small open economy with perfect capital mobility, the real interest rate will always be:
- A) above the world real interest rate.
  - B) below the world real interest rate.
  - C) equal to the world real interest rate.
  - D) equal to the world nominal interest rate.

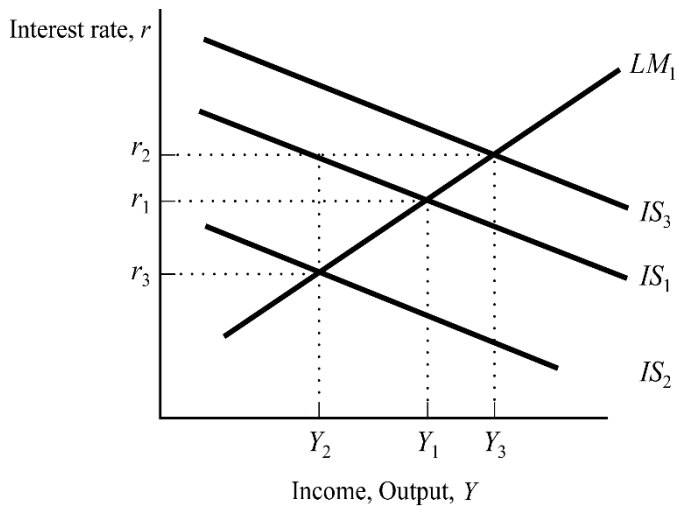


18. (Exhibit Above: Saving and Investment in a Small Open Economy) In a small open economy, if the world interest rate is  $r_3$ , then the economy has:
- A) a trade surplus.
  - B) balanced trade.
  - C) a trade deficit.**
  - D) positive capital outflows.
19. If the number of employed workers equals 200 million and the number of unemployed workers equals 20 million, the unemployment rate equals \_\_\_\_\_ percent (rounded to the nearest percent).
- A) 0
  - B) 9**
  - C) 10
  - D) 20
20. If the steady-state rate of unemployment equals 0.10 and the fraction of employed workers who lose their jobs each month (the rate of job separations) is 0.02, then the fraction of unemployed workers who find jobs each month (the rate of job findings) must be:
- A) 0.02.
  - B) 0.08.
  - C) 0.10.
  - D) 0.18.**
21. One reason for unemployment is that:
- A) it takes time to match workers and jobs.**
  - B) all jobs are identical.
  - C) the labor market is always in equilibrium.
  - D) a laid-off worker can immediately find a new job at the market wage.

22. The unemployment resulting from wage rigidity and job rationing is called \_\_\_\_\_ unemployment.
- A) frictional
  - B) structural**
  - C) minimum-wage
  - D) insider
23. Okun's law is the \_\_\_\_\_ relationship between real GDP and the \_\_\_\_\_.
- A) negative; unemployment rate**
  - B) negative; inflation rate
  - C) positive; unemployment rate
  - D) positive; inflation rate
24. Most economists believe that prices are:
- A) flexible in the short run but many are sticky in the long run.
  - B) flexible in the long run but many are sticky in the short run.**
  - C) sticky in both the short and long runs.
  - D) flexible in both the short and long runs.
25. The aggregate demand curve tells us possible:
- A) combinations of  $M$  and  $Y$  for a given value of  $P$ .
  - B) combinations of  $M$  and  $P$  for a given value of  $Y$ .
  - C) combinations of  $P$  and  $Y$  for a given value of  $M$ .**
  - D) results if the Federal Reserve reduces the money supply.
26. In the Keynesian-cross model, actual expenditures differ from planned expenditures by the amount of:
- A) liquidity preference.
  - B) the government-purchases multiplier.
  - C) unplanned inventory investment.**
  - D) real money balances.



27. (Exhibit Above: Keynesian Cross) In this graph, if firms are producing at level  $Y_1$ , then inventories will \_\_\_\_\_, inducing firms to \_\_\_\_\_ production.
- A) rise; increase
  - B) rise; decrease
  - C) fall; increase**
  - D) fall; decrease
28. An explanation for the slope of the  $IS$  curve is that as the interest rate increases, the quantity of investment \_\_\_\_\_, and this shifts the expenditure function \_\_\_\_\_, thereby decreasing income.
- A) increases; downward
  - B) increases; upward
  - C) decreases; upward
  - D) decreases; downward**
29. Changes in fiscal policy shift the:
- A)  $LM$  curve.
  - B) money demand curve.
  - C) money supply curve.
  - D)  $IS$  curve.**

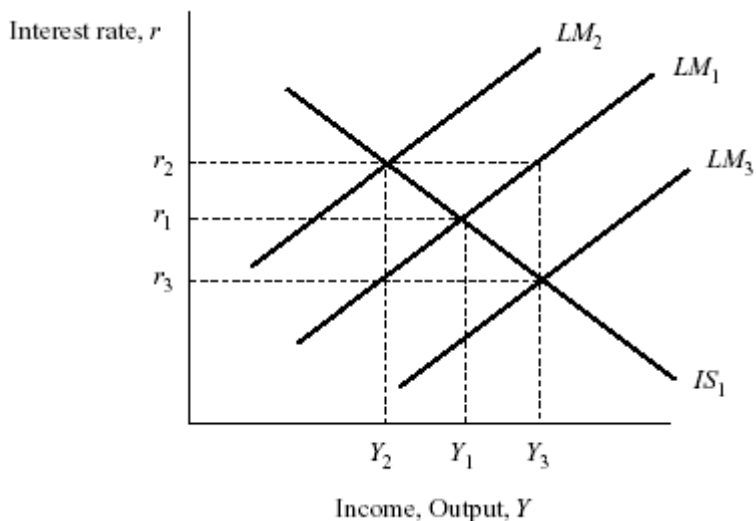


30. (Exhibit Above: *IS–LM* Fiscal Policy) Based on the graph, starting from equilibrium at interest rate  $r_1$  and income  $Y_1$ , a tax cut would generate the new equilibrium combination of interest rate and income:

- A)  $r_2, Y_2$
- B)  $r_3, Y_2$
- C)  $r_2, Y_3$
- D)  $r_3, Y_3$

31. Using the *IS–LM* analysis, if the *LM* curve is not horizontal, the multiplier for an increase in government spending is \_\_\_\_\_ for an increase in government purchases using the Keynesian-cross analysis.

- A) larger than the multiplier
- B) the same as the multiplier
- C) smaller than the multiplier
- D) sometimes larger and sometimes smaller than the multiplier

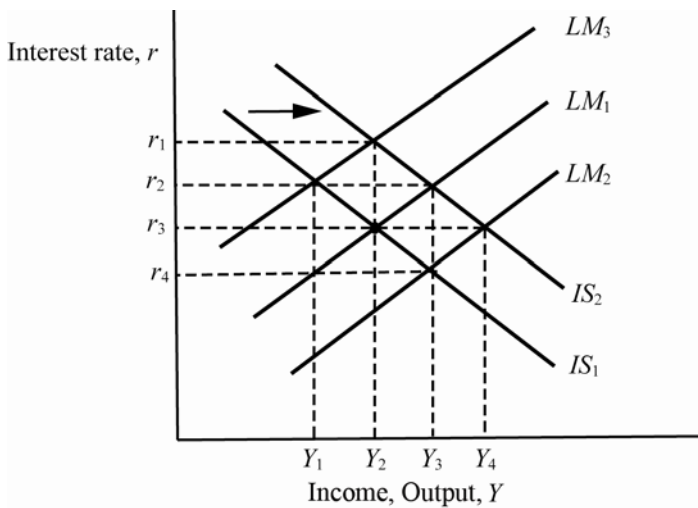


32. (Exhibit Above: *IS–LM* Monetary Policy) Based on the graph, starting from equilibrium at interest rate  $r_1$  and income  $Y_1$ , a decrease in the money supply would generate the new equilibrium combination of interest rate and income:

A)  $r_2, Y_2$   
 B)  $r_3, Y_2$   
 C)  $r_2, Y_3$   
 D)  $r_3, Y_3$

33. (Exhibit Above: *IS–LM* Monetary Policy) Based on the graph, starting from equilibrium at interest rate  $r_1$  and income  $Y_1$ , a decrease in the money supply would generate the new equilibrium combination of interest rate and income:

A)  $r_2, Y_2$   
 B)  $r_3, Y_2$   
 C)  $r_2, Y_3$   
 D)  $r_3, Y_3$

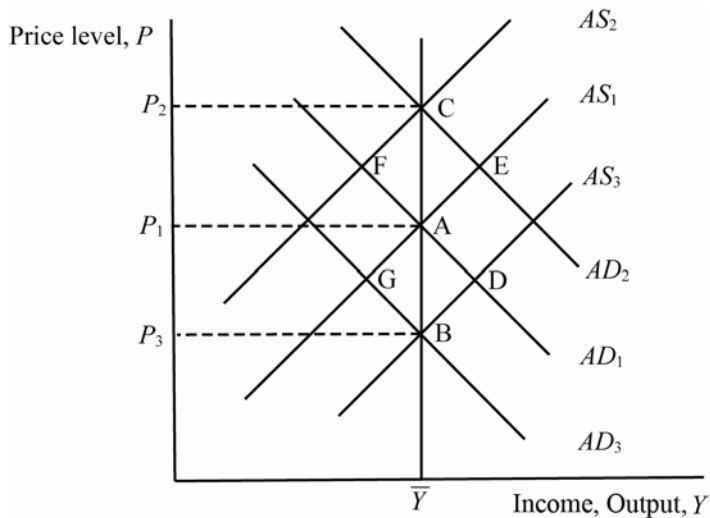


34. (Exhibit Above: Policy Interaction) Based on the graph, starting from equilibrium at interest rate  $r_3$ , income  $Y_2$ ,  $IS_1$ , and  $LM_1$ , if there is an increase in government spending that shifts the  $IS$  curve to  $IS_2$ , then in order to keep the interest rate constant, the Federal Reserve should \_\_\_\_\_ the money supply shifting to \_\_\_\_\_.

A) increase;  $LM_2$   
 B) decrease;  $LM_2$   
 C) increase;  $LM_3$   
 D) decrease;  $LM_3$



35. An increase in consumer saving for any given level of income will shift the:
- A) *LM* curve upward and to the left.
  - B) *LM* curve downward and to the right.
  - C) *IS* curve downward and to the left.**
  - D) *IS* curve upward and to the right.



36. (Exhibit Above: *AD-AS* Shifts) Starting from long-run equilibrium at A with output equal to  $\bar{Y}$  and the price level equal to  $P_1$ , if there is an unexpected monetary contraction that shifts aggregate demand from  $AD_1$  to  $AD_3$ , then the long-run neutrality of money is represented by the movement from:

- A) A to B**
- B) A to G
- C) A to C
- D) A to D

37. (Exhibit Above: *AD-AS* Shifts) Starting from long-run equilibrium at A with output equal to  $\bar{Y}$  and the price level equal to  $P_1$ , if there is an unexpected monetary contraction that shifts aggregate demand from  $AD_1$  to  $AD_3$ , then the short-run non-neutrality of money is represented by the movement from:

- A) A to B
- B) A to G**
- C) A to C
- D) A to D

38. The Phillips curve depends on *all* of the following forces *except*:
- A) the current exchange rate.
  - B) expected inflation.
  - C) the deviation of unemployment from its natural rate.
  - D) supply shocks.
39. The Phillips curve shows a \_\_\_\_\_ relationship between inflation and unemployment, and the short-run aggregate supply curve shows a \_\_\_\_\_ relationship between the price level and output.
- A) positive; positive
  - B) positive; negative
  - C) negative; negative
  - D) negative; positive
40. After the fiscal stimulus to address the COVID-19 pandemic, the CBO predicts the debt-to-GDP ratio in 2021 will be approximately
- A) 50%
  - B) 10%
  - C) 100%
  - D) 200%

**Short Answer Question. (80 points)**

#41. Use the information in Tables 1 and 2 below to answer the following questions.

Table 1. Quantities and Prices for Goods X, Y and Z

Product	Quantity (in millions)		Price (in \$)	
	2019	2020	2019	2020
X	10	15	\$40	\$50
Y	15	15	\$20	\$10
Z	8	10	\$10	\$10

Table 2. Goods and Money Market Equations (with  $r$  in percentage terms)

Money Market	Goods (and Services) Market
$M = 10,000$	$C = 100 + 0.8(Y - T)$
$L(Y, r) = 0.3Y - r$	$I = 140 - 2r; NX = -50$
$P_{2020}$	$G = 50, T = 50$

(a) (10 pts) Use Table 1 to calculate real GDP ( $Y$ ) and the GDP deflator ( $P$ ) in 2020 using 2019 as the base year.

$$\mathbf{Nominal\ GDP}_{2019} = (10 \times \$40) + (15 \times \$20) + (8 \times \$10) = \$400 + \$300 + \$80 = \mathbf{\$780}$$

$$\mathbf{Nominal\ GDP}_{2020} = (15 \times \$50) + (15 \times \$10) + (10 \times \$10) = \$750 + \$150 + \$100 = \mathbf{\$1,000}$$

$$\mathbf{Y}_{2019} = \mathbf{Real\ GDP}_{2019} = \mathbf{Nominal\ GDP}_{2019} = \mathbf{\$780}$$

$$\mathbf{Y}_{2020} = \mathbf{Real\ GDP}_{2020} = (15 \times \$40) + (15 \times \$20) + (10 \times \$10) = \$600 + \$300 + \$100 = \mathbf{\$1,000}$$

$$\mathbf{P}_{2019} = \mathbf{GDP\ Deflator}_{2019} = \mathbf{100}$$

$$\mathbf{P}_{2020} = \mathbf{GDP\ Deflator}_{2020} = \frac{\mathbf{Nominal\ GDP}_{2020}}{\mathbf{Real\ GDP}_{2020}} \times 100 = \frac{\mathbf{\$1,000}}{\mathbf{\$1,000}} \times 100 = \mathbf{100}$$

(b) (10 pts) Calculate the IS and LM equations and put them on a graph with the real interest rate ( $r$ ) on the vertical axis and real GDP ( $Y$ ) on the horizontal axis. Superimpose the 2020 real GDP value from part (a) as the vertical LRAS curve. Then calculate the short-run equilibrium values,  $r_*$  and  $Y_*$ .

**IS Equation**

$$Y = C + I + G + NX$$

$$Y = 100 + 0.8(Y - 50) + 140 - 2r + 50 - 50$$

$$0.2Y = 200 - 2r$$

$$r = 100 - 0.1Y$$

**LM Equation**

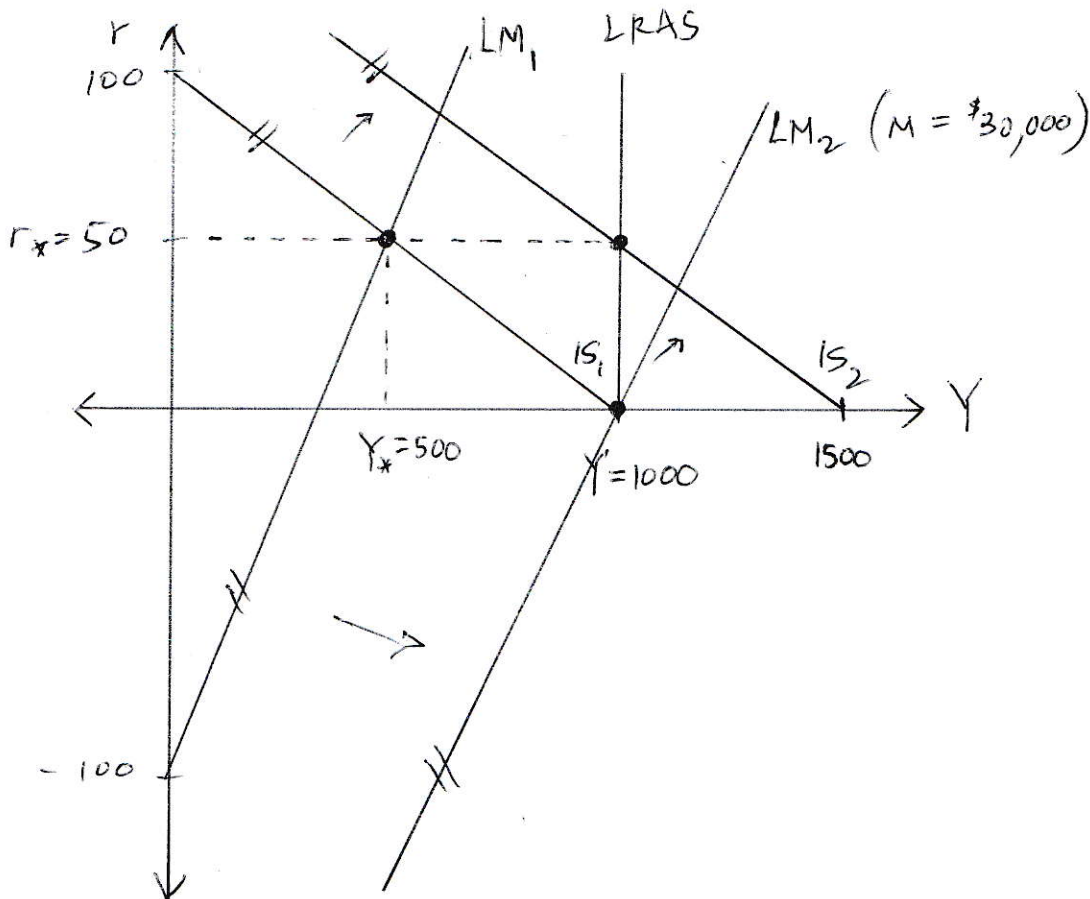
$$M/P = L(Y, r)$$

$$100 = 0.3Y - r$$

$$r = -100 + 0.3Y$$

Setting IS equal to LM:  $100 - 0.1Y = -100 + 0.3Y$ .

Solving for  $r$  gives  $r_* = 50$  and  $Y_* = 500$ .



- (c) (10 pts) Holding the real interest rate fixed (or equivalently ignoring the money market), how much would fiscal policymakers need to increase  $G$  to get us back to the LRAS curve? Show this on your graph and show your calculations.

**Fiscal policymakers need to shift the IS curve to the right by 500. Since the government spending multiplier is  $\frac{dY}{dG} = \frac{1}{1-MPC} = \frac{1}{1-0.8} = 5$ , fiscal policy makers would need to increase government spending by 100.**

- (d) (10 pts) Holding the real interest rate fixed (or equivalently ignoring the money market), how much would fiscal policymakers need to decrease  $T$  to get us back to the LRAS curve? Provide an intuitive explanation for why the increase in  $G$  (from part (c)) is different than the decrease in  $T$ .

**Fiscal policymakers need to shift the IS curve to the right by 500. Since the tax multiplier is  $\frac{dY}{dT} = \frac{-MPC}{1-MPC} = \frac{-0.8}{1-0.8} = -4$ , fiscal policy makers would need to decrease taxes by 125. The increase in  $G$  is smaller than the necessary decrease in  $T$  because household will save 20% of the tax reduction, leading to a smaller direct stimulus to the economy.**

- (e) (BONUS 10 pts) Find the necessary increase in the money supply ( $M$ ) and the resulting equilibrium real interest rate ( $r$ ) that returns the economy to the LRAS curve assuming no change in  $G$  or  $T$ .

**Since the IS curve intersects the LRAS curve at  $r = 0$  and  $Y = 1,000$ , we need to find the money supply that is consistent with these two values. This implies ....**

### LM Equation

$$M/P = L(Y, r)$$

$$M/100 = 0.3(1000) - 0$$

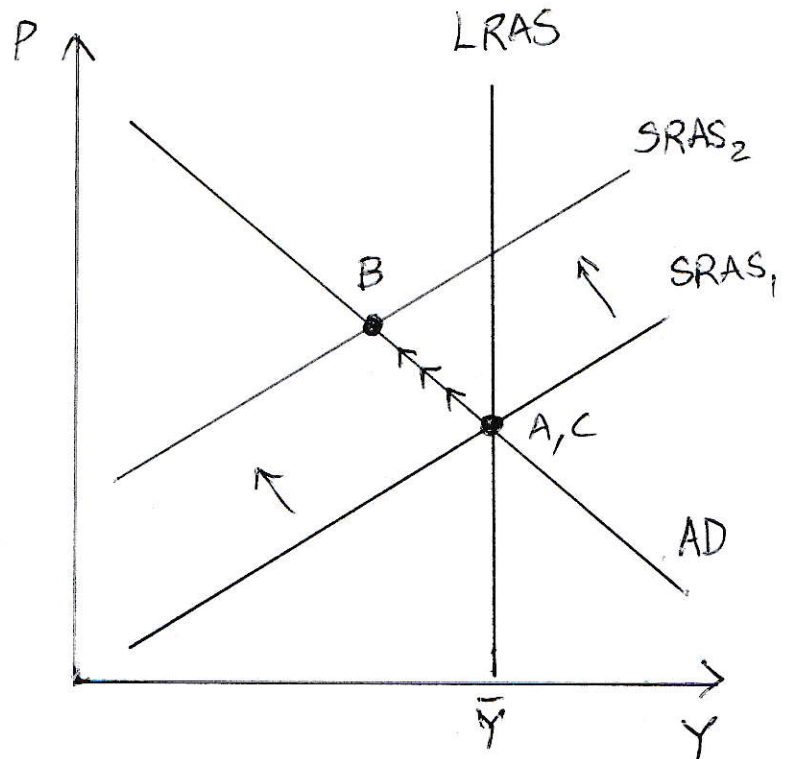
$$M = 100 \times 300 = 30,000$$

**The Federal Reserve therefore needs to undertake open market operations such that  $\Delta M = 20,000$ . They would do this by purchasing government securities until the money supply reached  $M = 30,000$ .**

#42. (40 pts) Use an AD-SRAS-LRAS to answer the two questions below.

- (a) (20 pts) Assume that OPEC starts enforcing oil production quotas and the global supply of oil declines. As a result, energy prices start to increase. This causes the costs of production for U.S. firms to increase. Use the AD-SRAS-LRAS diagram to describe the transition of the macroeconomy from the short-run to the long-run without government intervention.

The increase in energy prices will shift the SRAS up and to the left. As a result, the economy will transition from its original equilibrium (Point A) to a new equilibrium (Point B) with lower real GDP and a higher price level. The macroeconomy is experiencing stagflation. The recession will not last forever. Eventually, the increased unemployment and lower production will give firms an incentive to offer lower wage and salaries. This will shift the SRAS curve down and to the right until the recession ends. It's possible this transition from Point B to Point C may be slow and result in a prolonged recession.



- (b) (20 pts) Now assume the Federal Reserve and Congress are concerned about future inflation, output and unemployment. Describe in words, using the AD-SRAS-LRAS diagram as a guide, the possible stabilization strategies for Congress and the Fed. In particular, discuss the tradeoffs they face.

If the Fed and Congress are concerned about rising unemployment, reduced real GDP, and increasing prices, they could attempt to stabilize the economy. However, they face a tradeoff. If they try to reduce unemployment (and increase real GDP) through expansionary fiscal and/or monetary policy and shift the AD curve to the right, they will likely increase inflationary pressures. If they try to reduce inflation through contractionary fiscal and/or monetary policy and shift the AD curve to the left, they may worsen the unemployment situation and cause further declines in real GDP.