ECON 3010 Intermediate Macroeconomics
Solutions to the Final Exam

Multiple Choice Questions. (60 points; 2 pts each)

#1. Which of the following is a stock variable?

   a) **wealth**
   b) consumption
   c) investment
   d) income

#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. Since 1960, the U.S. ratio of labor income to total income has:

   a) been about 2.5 to 1.
   b) **been about 0.7.**
   c) increased steadily.
   d) decreased steadily.

#4. The government spending component of GDP includes *all* of the following *except*:

   a) federal spending on goods.
   b) state and local spending on goods.
   c) **federal spending on transfer payments.**
   d) federal spending on services.

#5. To reduce the money supply, the Federal Reserve:

   a) buys government bonds.
   b) **sells government bonds.**
   c) creates demand deposits.
   d) destroys demand deposits.

#6. If the real interest rate declines by 1 percent and the inflation rate increases by 2 percent, the nominal interest rate must:

   a) increase by 2 percent.
   b) increase by 1 percent.
   c) remain constant.
   d) decrease by 1 percent.

#7. The *ex ante* real interest rate is based on _____ inflation, while the *ex post* real interest rate is based on _____ inflation.

   a) expected; actual
   b) core; actual
   c) actual; expected
   d) expected; core

#8. One possible benefit of moderate inflation is:

   a) a reduction in boredom attributable to the changing prices.
   b) the elimination of menu costs.
   c) better functioning labor markets.
   d) increased certainty about the future.

#9. If domestic saving exceeds domestic investment, then net exports are _____ and net capital outflows are _____.

   a) positive; positive
   b) positive; negative
   c) negative; negative
   d) negative; positive

#10. When exports exceed imports, *all* of the following are true *except*:

   a) net capital outflows are positive.
   b) net exports are positive.
   c) domestic investment exceeds domestic saving.
   d) domestic output exceeds domestic spending.

Real interest rate, r — Investment, saving, I, S
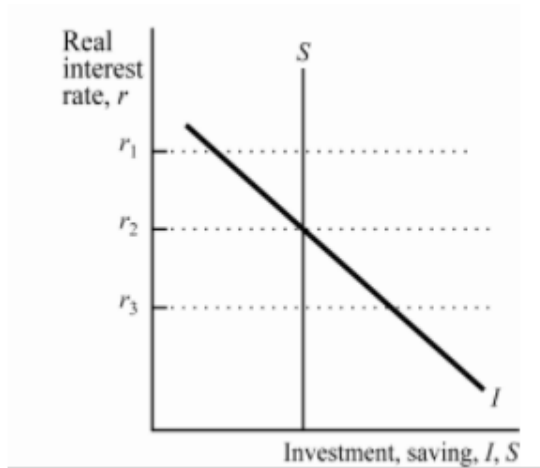
#11. In a small open economy, if the world interest rate is r_1, then the economy has:

a) a trade surplus.
b) balanced trade.
c) a trade deficit.
d) negative capital outflows

#12. Starting from a trade balance, if the world interest rate falls, then, holding other factors constant, in a small open economy the amount of domestic investment will _____ and net exports will _____.
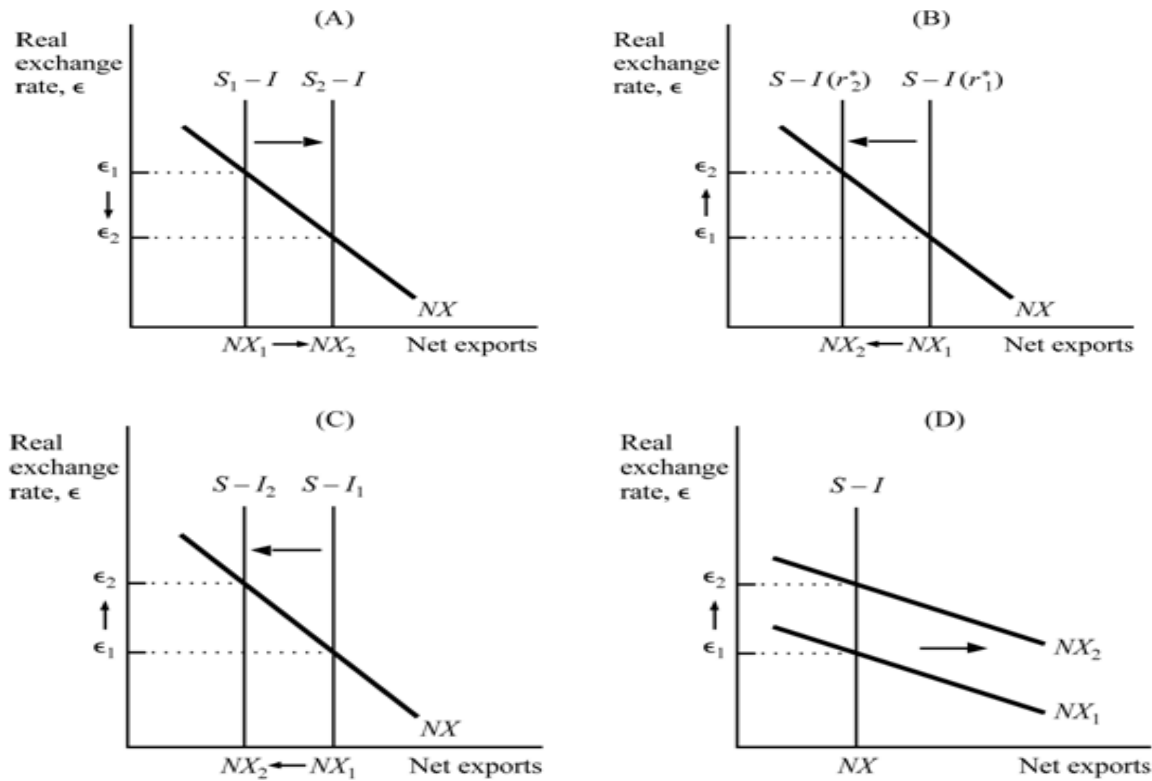
a) increase; increase
b) increase; decrease
c) increase, not change
d) decrease; increase

#13. If the real exchange rate is high, foreign goods:

a) and domestic goods are both relatively expensive.
b) and domestic goods are both relatively cheap.
c) are relatively expensive and domestic goods are relatively cheap.
d) are relatively cheap and domestic goods are relatively expensive.

#14. In a steady state:

a) no hiring or firings are occurring.
b) the number of people finding jobs equals the number of people losing jobs.
c) the number of people finding jobs exceeds the number of people losing jobs.
d) the number of people losing jobs exceeds the number of people finding jobs.

(A)

Real exchange rate, ϵ

$S_1 - I$ $S_2 - I$

ϵ_1

$\downarrow$

ϵ_2

NX

$NX_1 \longrightarrow NX_2$ Net exports

(B)

Real exchange rate, ϵ

$S - I(r_2^*)$ $S - I(r_1^*)$

ϵ_2

$\uparrow$

ϵ_1

NX

$NX_2 \longleftarrow NX_1$ Net exports

(C)

Real exchange rate, ϵ

$S - I_2$ $S - I_1$

ϵ_2

$\uparrow$

ϵ_1

NX

$NX_2 \longleftarrow NX_1$ Net exports

(D)

Real exchange rate, ϵ

$S - I$

ϵ_2

$\uparrow$

ϵ_1

NX_2

NX_1

NX Net exports

#15. Which of the panels illustrates the impact on the real exchange rate of contractionary fiscal policies at home?

a)   (A)
b)   (B)
c)   (C)
d)   (D)

#16. Discouraged workers are individuals who:

a)   have jobs that do not match their skills (e.g., a Ph.D. driving a taxi cab).
b)   have been unemployed for more than 26 weeks.
c)   call themselves unemployed but are not seriously looking for a job.
d)   want a job but have given up looking for one.

#17. 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

#18. Along an aggregate demand curve, which of the following are held constant?

    a) real output and prices
    b) nominal output and velocity
    c) the money supply and real output
    d) the money supply and velocity

#19. The short run refers to a period:

    a) of several days.
    b) during which prices are sticky and unemployment may occur.
    c) during which capital and labor are fully employed.
    d) during which there are no fluctuations.

#20. In the short run, a favorable supply shock causes:

    a) both prices and output to rise.
    b) prices to rise and output to fall.
    c) prices to fall and output to rise.
    d) both prices and output to fall.

#21. The *IS* curve plots the relationship between the interest rate and _____ that arises in the market for _____.
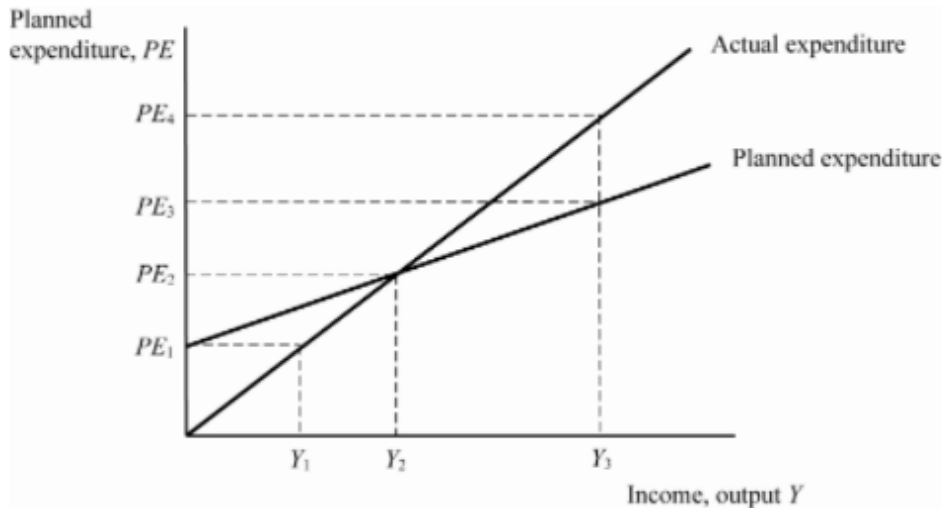
    a) national income; goods and services
    b) the price level; goods and services
    c) national income; money
    d) the price level; money

#22. In the *IS–LM* model under the usual conditions in a closed economy, an increase in government spending increases the interest rate and crowds out:

    a) prices.
    b) investment.
    c) the money supply.
    d) taxes.

#23. According to the *IS–LM* model, if Congress raises taxes but the Fed wants to hold the interest rate constant, then the Fed must _____ the money supply.

    a) increase
    b) decrease
    c) first increase and then decrease
    d) first decrease and then increase

Planned
expenditure, *PE*

Actual expenditure

Planned expenditure

PE₄

PE₃

PE₂

PE₁

Y_1 Y_2 Y_3

Income, output *Y*

#24. 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

#25. A tax cut shifts the _____ to the right, and the aggregate demand curve _____.

    a)   *IS*; shifts to the right
    b)   *IS*; does not shift
    c)   *LM*: shifts to the right
    d)   *LM*; does not shift

#26. The short-run Phillips curve:

    a)   shifts upward if expected inflation increases.
    b)   shifts upward if expected inflation decreases.
    c)   shifts downward if expected inflation increases.
    d)   is vertical.

#27. If the ratio of reserves to deposits (*rr*) increases, while the ratio of currency to deposits (*cr*) is constant and the monetary base (*B*) is constant, then:

    a)   it cannot be determined whether the money supply increases or decreases.
    b)   the money supply increases.
    c)   the money supply decreases.
    d)   the money supply does not change.

Interest rate, *r*

LRAS   LM₁

LM₂

C

A   D

B   IS₂

IS₁

$\bar{Y}$

Income, Output, *Y*
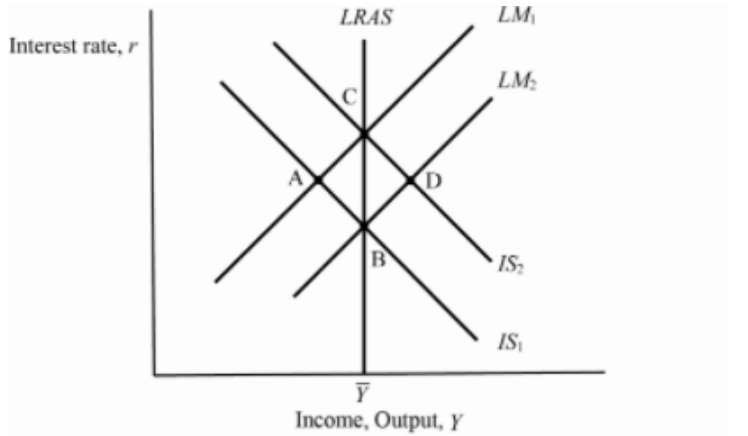
#28. Based on the graph, if the economy starts from a short-term equilibrium at D, then the long-run equilibrium will be at _____ with a _____ price level.

a) B; higher
b) B; lower
c) C; higher
d) C; lower

#29. 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

Bank Balance Sheet			
Assets		**Liabilities & Net Worth**	
Reserves	$ 10,000	Deposits	$100,000
Loans	100,000	Debt	20,000
Securities	40,000	Equity	30,000

#30. Based on the table, what is the reserve-deposit ratio at the bank?

a) 3 percent
b) 5 percent
c) 10 percent
d) 15 percent

Problem Solving / Essay Questions. (122 points)

#21. (30 pts) Consider an economy that produces 3 goods. Unless otherwise stated, 2017 is the base year.

| | Quantity | | Price | |
Product	2017	2018	2017	2018
A	5	7	$30	$40
B	6	4	$20	$40
C	8	12	$15	$20

(a) (10 pts) Calculate nominal and real GDP for 2017 and 2018. What is the GDP deflator in 2017 and 2018? What is the corresponding annual growth rate of the economy and the annual inflation rate?

Nominal GDP in 2017 $= (5 \times \$30) + (6 \times \$20) + (8 \times \$15) = \$390$.

Nominal GDP in 2018 $= (7 \times \$40) + (4 \times \$40) + (12 \times \$20) = \$680$.

Real GDP in 2017 = Nominal GDP in 2017.

Real GDP in 2018 $= (7 \times \$30) + (4 \times \$20) + (12 \times \$15) = \$470$.

GDP deflator in 2017 $= 100 \times$ (Nominal GDP in 2017 / Real GDP in 2017) $= 100$.

GDP deflator in 2018 $= 100 \times$ (Nominal GDP in 2018 / Real GDP in 2018) $= 100 \times \left(\frac{680}{470}\right) = 145$.

Annual real GDP growth rate $= 100 \times \left(\frac{470-390}{390}\right) = 20.5\%$

Annual GDP deflator inflation rate $= 45\%$.

(b) (10 pts) Assume that the typical consumer's basket of goods is given by the **average of the quantities between 2017 and 2018**. Calculate the CPI for 2017 and 2018, as well as the annual CPI inflation rate.

CPI in 2017 $= 100$;   CPI in 2018 $= 100 \times \frac{(6\times\$40)+(5\times\$40)+(10\times\$20)}{(6\times\$30)+(5\times\$20)+(10\times\$15)} = 100 \times \frac{\$640}{\$430} = 149$.

Annual CPI inflation rate $= 49\%$.

(c) (10 pts) The price of good B increased sharply between 2017 and 2018. At the same time, the quantity of good B dropped. What is a possible explanation for this relationship? Which measure of inflation – the GDP deflator or the CPI – is better suited to account for this phenomenon? Explain.

A possible explanation is that consumers switched from Good B to Good A (and/or Good C). The GDP deflator is better suited to account for this substitution effect because the basket of goods is not fixed like the CPI. As a result, the CPI inflation rate is likely biased upwards.

#22. (30 pts) This question focuses on the labor market and unemployment using actual U.S. data. The adult population (N) of the U.S. is <u>approximately</u> 256 million. The labor force is <u>approximately</u> 160.5 million and the number of employed workers (E) is <u>approximately</u> 154 million.

(a) (10 pts) How many people are unemployed? What is the unemployment rate? How does it compare to the reported U.S. unemployment rate for November 2017? What is the labor force participation rate?

The number of unemployed workers is 6.5 million, which is the difference between the total labor force (160.5 million) and the number of employed workers (154 million). The unemployment rate is $u = \frac{6.5}{160.5} = 4.0\%$. The U.S. unemployment rate for November was 4.1%, so it is a little lower than the November rate. The labor force participation rate is $\frac{160.5}{256} = 62.7\%$.

(b) (10 pts) The rate of job separation (s) is 0.01. Calculate the rate of job finding (f) that is consistent with a 4% natural rate of unemployment? How many people are losing their job each month?

The formula for the natural rate of unemployment is $u_n = \frac{s}{s+f} = \frac{0.01}{0.01+f} = 4\%$. Solving for f, the rate of job finding must be $f = 0.24$. Each month $sE = 0.01 * 154 = 1.54$ million workers are separated from their jobs.

(c) (10 pts) Assume that Congress and the President are proposing to abolish the federal minimum wage. What effect will the proposal have on f, s, and the natural rate of unemployment? Please explain.

The proposal will likely decrease the rate of job separation (s) and the natural rate of unemployment. It will likely increase the rate of job finding (f). No minimum wage will decrease the labor costs for firms using lower skilled workers. In response, these firms will lay-off fewer workers, decreasing the rate of job separation (s) and the natural rate of unemployment. Because the pool of unemployed workers will decrease, it will also be easier for unemployed workers to find a job. This will increase the rate of job finding (f).

#23. (32 pts) Consider the following short-run, open-economy model of the economy.

Goods Market	Money Market
$C = 100 + 0.9(Y - T)$	$M = 21,500$
$I = 280 - 10r; NX = -100$	$P = 10$
$G = 100; T = 200$	$L(Y, r) = Y - 50r$

(a) (8 pts) Graph the IS and LM equations and the find the equilibrium values of r and Y.

IS Equation

$Y = C + I + G + NX$

$Y = 100 + 0.9(Y - 200) + 280 - 10r + 100 - 100$
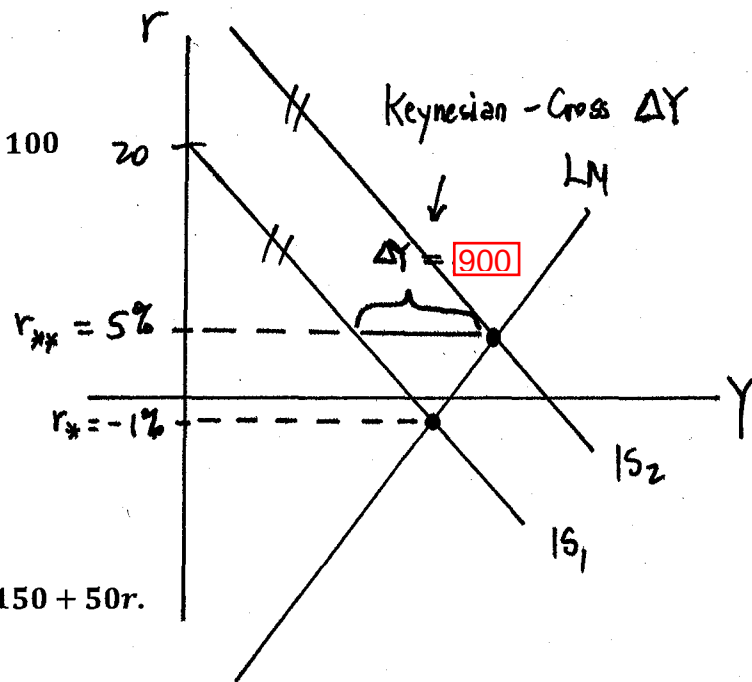
$0.1Y = 200 - 10r$

$Y = 2000 - 100r$

LM Equation

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

$2150 = Y - 50r$

$Y = 2150 + 50r$

Setting IS equal to LM gives: $2000 - 100r = 2150 + 50r.$

Solving for r gives $r_* = -1$ and $Y_* = 2100$.

(b) (8 pts) The equilibrium interest rate in part (a) is a little unusual. Give an explanation for this value. Assume that inflation is currently 1%, how would the Fed target a 1% nominal interest rate? Explain.

It is reasonable to have a negative <u>real</u> interest rate. From the Fisher equation, $i = r + \pi$. Therefore, the nominal bank rate (i) can still be positive if the inflation rate is bigger in magnitude than the real interest rate.

If the inflation rate is currently 1%, then the nominal rate is 0%. To target a 1% nominal rate, the inflation rate would need to be 2%. Assuming a constant real GDP and velocity of money, the Fed can accomplish this by increasing the money supply 1%. The new money supply would be 21,715. The money supply can be increased through open market operations, the purchasing of government securities.

(c) (8 pts) Policymakers plan to balance the budget by decreasing taxes. What is the size of the Keynesian-cross tax multiplier and the horizontal shift in the IS curve? Show this on your graph in part (a). What are the resulting IS-LM equilibrium values of r and Y after the shift? What is the size of the <u>effective</u> IS-LM tax multiplier?

The Keynesian-cross tax multiplier is $\frac{-MPC}{1-MPC} = \frac{-0.9}{0.1} = -9$. If policymakers decreases taxes by 100, it will shift the IS curve to the right by 900. The new IS curve is $Y = 2900 - 100r$. The new equilibrium values are $r_* = 5$ and $Y_* = 2400$. The effective IS-LM tax multiplier is

therefore $\frac{\Delta Y}{\Delta T} = \frac{300}{-100} = -3$.

(d) (8 pts) At equilibrium in part (a), what is the value of national saving? Investment? Net capital outflows? Is the foreign exchange market in equilibrium? Show the results in a diagram.

The value of national saving is $S = Y - C - G = 2100 - 1810 - 100 = 190$. Investment is $I = 290$. Net capital outflows are $S - I = 190 - 290 = -100$, which is the supply of dollars. The demand for dollars is given by $NX = -100$, so the foreign exchange market is indeed in equilibrium.
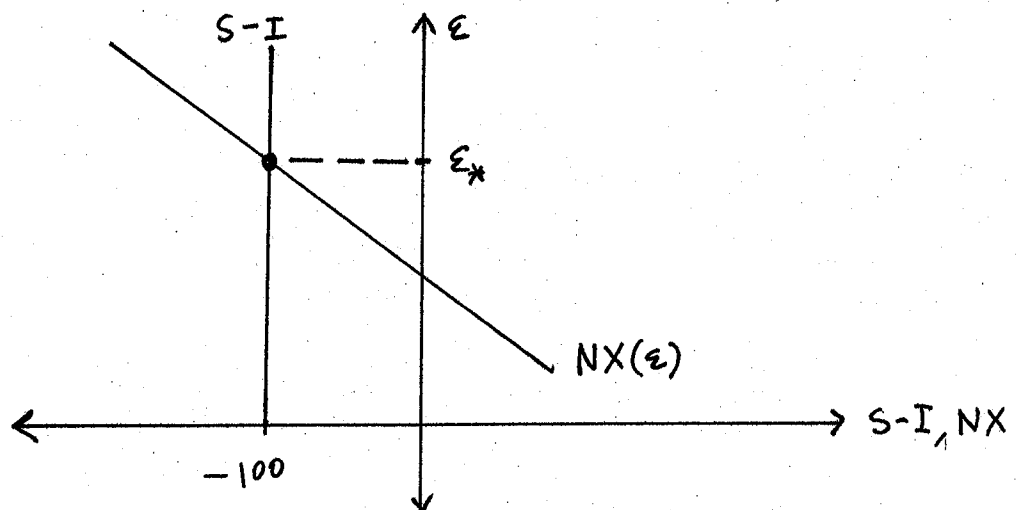
#24. (30 pts) AD-SRAS-LRAS model of the economy. Assume the SRAS curve is upward sloping.

(a) (15 pts) Janet Yellen recently warned that Bitcoin investors stand to lose a significant amount of money if the market for the cryptocurrency crashes. Assume that the market does indeed crash and causes a drop in the intercept of the aggregate consumption function. Use the AD-SRAS-LRAS diagram to discuss the predicted short- and long-run impacts on the price level, real GDP and unemployment. Clearly label your graph and write a concise paragraph to accompany your graph.

The reduction in consumption will shift the AD curve down and to the left. In the short run, the economy will experience a lower price level, lower real GDP, and higher unemployment. This is a movement from point A to point B on the graph. Over time, accumulated inventories and higher unemployment will force produces to lower prices, gradually shifting the SRAS down and to the right to a new long-run equilibrium at point C. Real GDP and unemployment will return to their natural levels, but the price level will be lower.
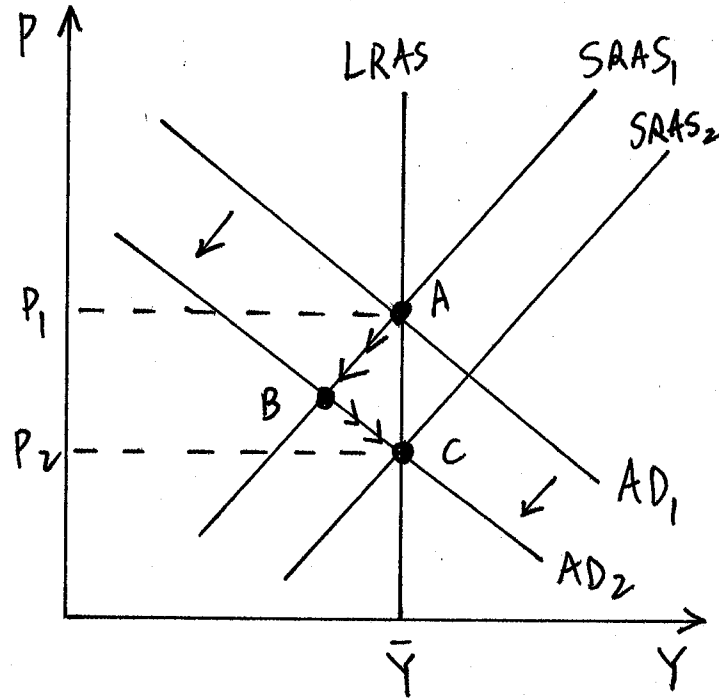
(b) (15 pts) How should President Trump and Congress respond? Use an AD-SRAS-LRAS diagram to support your discussion.

If the President and Congress are concerned about rising unemployment, they could increase government spending and/or lower taxes. This would shift the AD curve to the right so the unemployment rate would not increase as much. If they increased G (or decreased T) enough, they could completely offset the effect of the consumption reduction. The other option is for the President and Congress to do nothing and simply wait for the long run when firms will lower prices and wages, causing the economy to return to a long-run equilibrium.
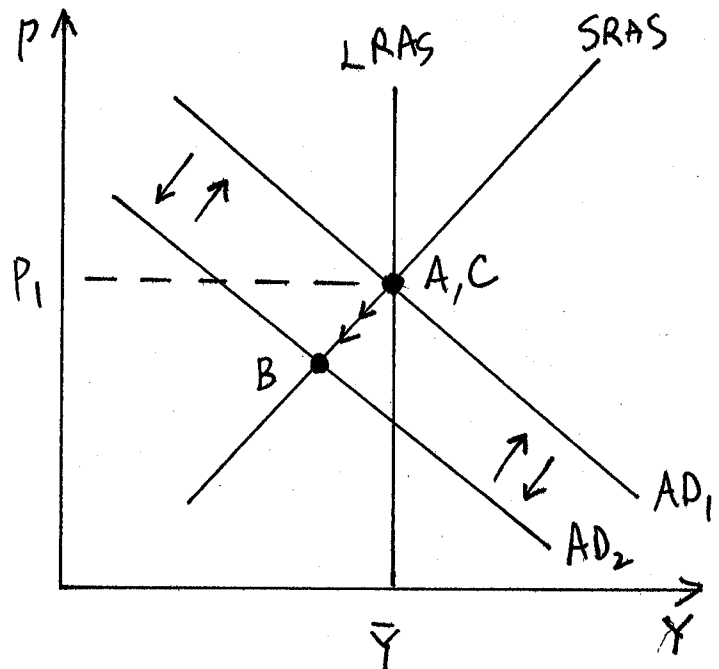
#25. (18 pts) Draw a line to match the best answer (right column) to the question (left column).

Current U.S. debt to GDP ratio   3%

Current U.S. deficit to GDP ratio   100%

Current U.S. unemployment rate   63%

Share of GDP going to workers: $Y = \sqrt{KL}$ 4%

Steady state unemployment rate ($s = 0.01, f = 0.09$)   10%

Current U.S. labor force participation rate   50%