

科目：微積分【政經系三年級】

1. (20分) Find the limits of the following functions:

(10分) (a)  $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 2x} - \sqrt{x^2 + x})$

(10分) (b)  $\lim_{x \rightarrow 0} \left( \frac{x}{x^2 + |x|} \right)$

2. (20分) Differentiate each function:

(10分) (a)  $f(x) = 2xe^{x^2+4}$

(10分) (b)  $f(x) = \frac{\log_3 x}{2x}$

3. (10分) Consider a monopolist's linear demand function

$$P = 10 - 2Q,$$

where  $P$  is the price of the good and  $Q$  is its quantity. The monopolist's total cost function is

$$TC = Q^2 - 8Q + 18.$$

Determine the level of output at which the monopolist should produce in order to maximize her profits. What is the optimal price that corresponds with this quantity? Confirm that this quantity represents maximum profits for the firm by using the second-order condition.

4. (10分) Find the local extreme values for the following function. The second-derivative test must be performed.

$$f(x, y) = -x^2 - 2y^2 + z^3 - 4xy - 2x - 12z + 80$$

5. (20分) Use the Lagrangian multiplier method to determine the optimal values for the following constrained optimization problem's choice variables. Use the sufficient condition to determine if they represent local maxima or local minima.

$$y = \ln(x + 2z) \text{ subject to } xz = 8$$

6. (10分) Find the solution to the following differential equation:

$$\dot{x}(t) = -2x(t) + 1, x(0) = 3$$

7. (10分) Integrate each function.

(5分) (a)  $\int_2^x e^{(x^2/4)} dx$

(5分) (b)  $\int \frac{18x^2}{6x^3 + 2} dx$

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申論題 (100% 每題 25 分)

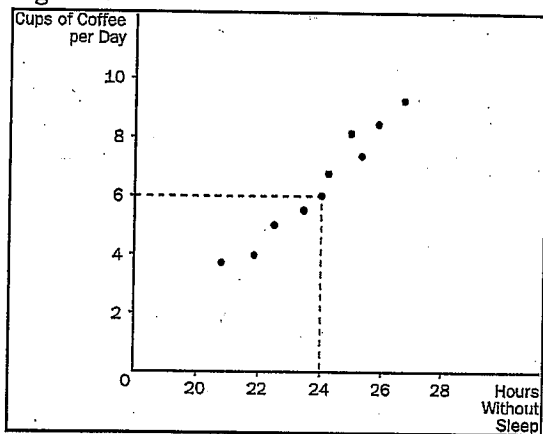
1. 請問「憲法」的政治義涵為何？其對國家政治之運作有何影響？  
一部民主的憲法至少應該包括哪些內容？又何謂「憲政之治」？  
而達成憲政之治的方式為何？
2. 何謂公共政策？在公共政策的決策(decision-making)過程中，又有哪些主流的決策理論(theories)與模式(models)，試說明與比較之。
3. 請簡述當前主流的「資本主義」(capitalism)與「社會主義」(socialism)之概念。
4. 請討論「族群」(ethnic)與「社群政治」(community politics)的意涵，及其所衍生的問題與爭議。

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**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 1. Without government's protection of property rights
- businesses would have less incentive to provide goods and services.
  - there would be less government regulation of businesses and prices would be lower for consumers.
  - taxes would be lower causing less market inefficiencies.
  - businesses would have more freedom with production processes.

**Figure 1**

- \_\_\_\_\_ 2. Refer to Figure 1. What would you say about the relationship between coffee and hours without sleep?
- The less coffee a person drinks per day, the more time he can go without sleep.
  - There is no relationship between how much coffee per day a person drinks and how long they can go without sleep.
  - The more coffee a person drinks per day, the longer he can go without sleep.
  - The relationship between cups of coffee per day and time without sleep is too unpredictable to consider.

For the following question(s), use the accompanying table.

**Table 1**

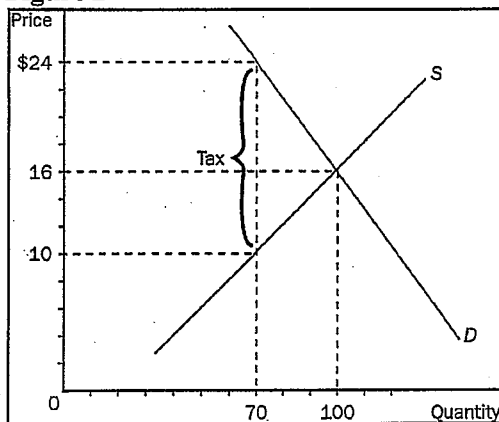
	Labor Hours needed to make one unit of:		Amount produced in 160 hours:	
	Quilts	Dresses	Quilts	Dresses
Helen	40	10	4	16
Carolyn	80	16	2	10

- \_\_\_\_\_ 3. Refer to Table 1. Helen has an absolute advantage in
- dresses and Carolyn has an absolute advantage in quilts.
  - quilts and Carolyn has an absolute advantage in dresses.
  - neither good and Carolyn has an absolute advantage in both goods.
  - both goods and Carolyn has an absolute advantage in neither good.
- \_\_\_\_\_ 4. What would happen to the equilibrium price and quantity of coffee if the wages of coffee-bean pickers fell and the price of tea fell?
- Price will fall and the effect on quantity is ambiguous.
  - Price will rise and the effect on quantity is ambiguous.
  - Quantity will fall and the effect on price is ambiguous.
  - Quantity will rise and the effect on price is ambiguous.

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5. As elasticity of demand increases the demand curve gets
- flatter and the price elasticity of demand will be less than 1.
  - steeper and the price elasticity of demand will be greater than 1.
  - flatter and the price elasticity of demand will be greater than 1.
  - steeper and the price elasticity of demand will be less than 1.
6. In January the price of widgets was \$2.00 and Wendy's Widgets produced 100 widgets. In February the price of widgets was \$2.50 and Wendy's Widgets produced 150 widgets. In March the price of widgets was \$3.00 and Wendy's Widgets produced 200 widgets. The price elasticity of supply of Wendy's Widgets was
- 1.80 when the price increased from \$2.00 to \$2.50 and 1.57 when the price increased from \$2.50 to \$3.00.
  - 2.00 when the price increased from \$2.00 to \$2.50 and 1.66 when the price increased from \$2.50 to \$3.00.
  - 1.66 when the price increased from \$2.00 to \$2.50 and 1.50 when the price increased from \$2.50 to \$3.00.
  - 0.56 when the price increased from \$2.00 to \$2.50 and 0.64 when the price increased from \$2.50 to \$3.00.

Figure 2

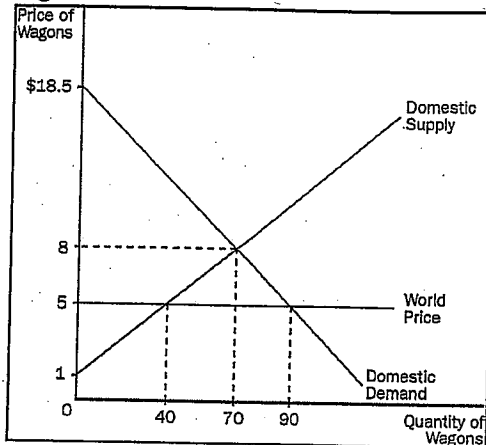


7. Refer to Figure 2. The per unit burden of the tax on the sellers is
- \$16.
  - \$14.
  - \$8.
  - \$6.
8. Producer surplus equals
- Value to buyers - Amount paid by buyers.
  - Amount received by sellers - Costs of sellers.
  - Value to buyers - Costs of sellers.
  - Value to buyers - Amount paid by buyers + Amount received by sellers - Costs of sellers.
9. Suppose that the equilibrium price in the market for widgets is \$5. If a law reduced the maximum legal price for widgets to \$4,
- consumer surplus would necessarily increase even if the lower price resulted in a shortage of widgets.
  - consumer surplus would necessarily decrease because the lower price would create a shortage of widgets.
  - consumer surplus might increase or decrease.
  - consumer surplus would be unaffected.

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10. Taxes cause deadweight losses because
- they transfer purchasing power to the government which always wastes money.
  - they prevent buyers and sellers from realizing some of the gains from trade.
  - marginal buyers and sellers leave the market causing the quantity sold to fall.
  - Both b and c are correct.

Figure 3



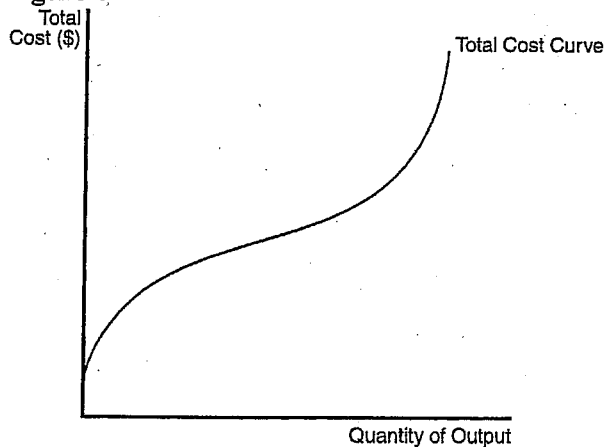
11. Refer to Figure 3. If this country chooses to trade, the price of wagons in this country would be
- \$8 and 70 wagons would be sold domestically.
  - \$5 and 40 wagons would be sold domestically.
  - \$5 and 70 wagons would be sold domestically.
  - \$5 and 90 wagons would be sold domestically.
12. When the social cost curve is above a product's supply curve we know that
- government has intervened in the market.
  - a negative externality exists in the market.
  - a positive externality exists in the market.
  - the market reached equilibrium on its own.
13. Chad's maple tree hangs over Amy's fence and drops leaves into her yard each autumn. The benefit to Chad of lower utility bills is about \$300. The cost to Amy of having her lawn cleaned and reseeded is \$350. Based on the Coase theorem
- Amy should pay Chad \$325 to cut down the tree.
  - Chad should pay Amy \$350 to have her lawn repaired and cleaned.
  - Chad should pay Amy \$400 to keep the tree.
  - Amy should build a higher fence.
14. Knowledge is an example of a
- public good.
  - private good.
  - common resource.
  - natural monopoly good.
15. Suppose all citizens in a certain city are given identical debit cards used to pay for toll roads. Which of the following statements would NOT be true, assuming that the debit cards could be sold privately from person to person?
- This would be a very egalitarian policy.
  - This system would end up being a redistribution of income from those that drive more to those that drive less.
  - This system could potentially be a redistribution of income from the rich to the poor if the poor drive less.

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d. The cost to the government of such a program would greatly outweigh the benefit to society.

16. Martavius faces a progressive federal income tax structure that has the following marginal tax rates: 0 percent on the first \$10,000, 10 percent on the next \$10,000, 15 percent on the next \$10,000, 25 percent on the next \$10,000 and 50 percent on all additional income. In addition, he must pay 5 percent of his income in state income tax and 15.3 percent of his labor income in federal payroll taxes. Marcus earns \$70,000 per year in salary and another \$20,000 per year in non-labor income. What is his average tax rate, and what is the marginal tax rate on his salary?
- His average tax rate is 17.19 percent and the marginal tax rate on his salary is 55 percent.
  - His average tax rate is 50.23 percent and the marginal tax rate on his salary is 70.3 percent.
  - His average tax rate is 53.63 percent and the marginal tax rate on his salary is 70.3 percent.
  - His average tax rate is 55.79 percent and the marginal tax rate on his salary is 70.3 percent.

Figure 4



17. Refer to Figure 4. Which of the following can be inferred from the figure above?
- Marginal cost is increasing at all levels of output.
  - Marginal product is increasing at low levels of output.
  - Marginal product is decreasing at high levels of output.

- (i) and (ii)
- (ii) and (iii)
- (i) and (iii)
- All of the above are correct.

18. Consider the following information about baseball production at Bob's Baseball Factory:

Worker	Marginal Product
1	3
2	5
3	8
4	10
5	7
6	4
7	2

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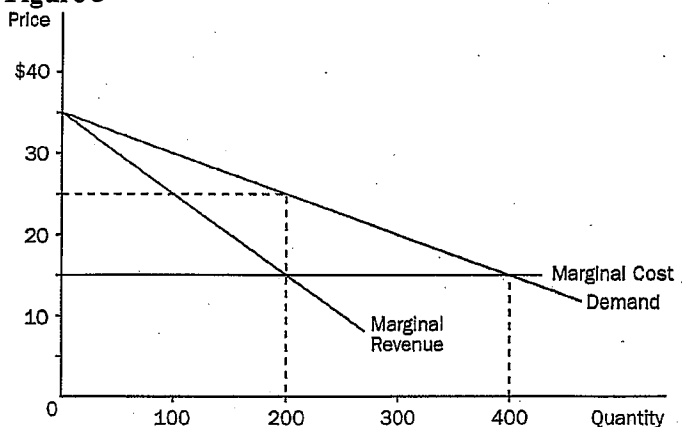
Bob pays all his workers the same wage and labor is his only variable cost. From this information we can conclude that Bob's average variable cost decreases

- as output rises from 0 to 10, but rises after that.
- as output rises from 0 to 26, but rises after that.
- as output rises from 0 to 33, but increases after that.
- continually as output rises.

19. If a competitive firm is currently producing a level of output at which marginal cost exceeds marginal revenue, then
- average revenue exceeds marginal cost.
  - the firm is earning a positive profit.
  - a one-unit decrease in output would increase the firm's profit.
  - All of the above are correct.

The figure below depicts the demand, marginal revenue and marginal cost curves of a profit-maximizing monopolist. Use the figure to answer the following questions.

Figure 5



20. Refer to Figure 5. If the monopoly firm is NOT allowed to price discriminate, then consumer surplus amounts to
- \$0.
  - \$500.
  - \$1,000.
  - \$2,000.
21. Barb and Sue are competitors in a local market. Each is trying to decide if it is better to advertise on TV, on radio, or not at all. If they both advertise on TV, each will earn a profit of \$5,000. If they both advertise on radio, each will earn a profit of \$7,000. If neither advertises at all, each will earn a profit of \$10,000. If one advertises on TV and other advertises on radio, then the one advertising on TV will earn \$8,000 and the other will earn \$3,000. If one advertises on TV and the other does not advertise, then the one advertising on TV will earn \$15,000 and the other will earn \$2,000. If one advertises on radio and the other does not advertise, then the one advertising on radio will earn \$12,000 and the other will earn \$4,000. If both follow their dominant strategy, then Barb will
- advertise on TV and earn \$5,000.
  - advertise on radio and earn \$7,000.
  - advertise on TV and earn \$15,000.
  - not advertise and earn \$10,000.

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- \_\_\_\_\_ 22. A monopolistically competitive firm is currently making a profit. If other firms enter the market, we would expect that the added competition will cause this firm to adjust its
- output so that it will operate closer to its efficient scale.
  - output so that it will operate further from its efficient scale.
  - output so that it will no longer be at its efficient scale.
  - output, but it might move either closer to or further from its efficient scale.
- \_\_\_\_\_ 23. Aurora Custom Cabinets produces and sells custom kitchen cabinets. The firm has determined that if it hires 10 workers, it can produce 4 sets of cabinets per day. Alternatively, if it hires 11 workers, it can produce 4.2 sets of cabinets per day. It sells each set of cabinets for \$2,000, and it pays each of its workers \$200 per day.
- For the 11th worker, the value of the marginal product of labor is \$500.
  - For the 11th worker, the marginal revenue product is \$400.
  - The firm is maximizing its profit.
  - If the firm is employing 11 workers, then its profit would increase if it cut back to 10 workers.
- \_\_\_\_\_ 24. Consumers suddenly prefer to do business with left-handed workers instead of right-handed workers. We would expect that the marginal revenue product of
- left-handed workers would rise, which would increase the demand for left-handed workers. This will increase the number of left-handed workers employed, which will in turn increase the marginal product of left-handed workers.
  - left-handed workers would rise, which would increase the demand for left-handed workers. This will increase the number of left-handed workers employed, which will in turn reduce the marginal product of left-handed workers.
  - right-handed workers would rise, which would increase the demand for right-handed workers. This will increase the number of right-handed workers employed, which will in turn increase the marginal product of right-handed workers.
  - right-handed workers would fall, which would reduce the demand for right-handed workers. This will reduce the number of right-handed workers employed, which will in turn reduce the marginal product of right-handed workers.
- \_\_\_\_\_ 25. People who grew up in the western part of Aquilonia have an accent distinct from people who grew up in the eastern part of the country. People from the west also receive lower wages than people from the east. From this information alone, we can conclude that it is possible that
- discrimination against people from the west exists.
  - discrimination against people from the east exists.
  - no discrimination exists.
  - All of the above are correct.
- \_\_\_\_\_ 26. Suppose that income is subject to constant marginal utility. From a Utilitarian perspective,
- some income redistribution from rich to poor would increase social welfare.
  - some income redistribution from poor to rich would increase social welfare.
  - any income redistribution would probably reduce social welfare.
  - any income redistribution would probably increase social welfare.
- \_\_\_\_\_ 27. When a consumer experiences a price increase for an inferior good, it is possible that the income effect is
- greater than the substitution effect and the demand curve will be downward sloping.
  - greater than the substitution effect and the demand curve will be upward sloping.
  - less than the substitution effect and the demand curve will be upward sloping.
  - less than the substitution effect but the substitution effect is positive and the demand curve will be upward sloping.



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28. On car insurance policies, State Ranch Insurance Company offers drivers an option: Policy 1 features a deductible of \$2,000 and it requires a driver to pay an annual premium of \$500; Policy 2 features a deductible of \$500 and it requires a driver to pay an annual premium of \$750.
- In offering these two policies, State Ranch is engaging in price discrimination.
  - In offering these two policies, State Ranch is attempting to sort out the safe drivers from the risky drivers.
  - Policy 1 is more of a burden for safe drivers than it is for risky drivers.
  - All of the above are correct.
29. A firm produces consumer goods and adds some to inventory in the third quarter. In the fourth quarter the firm sells the goods at a retail outlet which leaves their inventory diminished. As a result of these actions, what component(s) of real GDP change in the fourth quarter?
- only investment and it decreases.
  - only consumption and it increases.
  - Investment decreases and consumption increases.
  - None of the above is correct.

Use the following table to answer the following questions.

Table 2

GDP	\$110
Income Earned by Citizens Abroad	\$ 5
Income Foreigners Earn here	\$ 15
Depreciation	\$ 4
Indirect Business Taxes	\$ 6
Business Subsidies	\$ 2
Statistical Discrepancy	\$ 0
Retained Earnings	\$ 5
Corporate Income Taxes	\$ 6
Social Insurance Contributions	\$ 10
Interest Paid to Households by Government	\$ 5
Transfer Payments to Households from Government	\$ 15
Personal Taxes	\$ 30
Non-tax payments to Government	\$ 5

30. Refer to Table 2. National income for this economy is
- \$96.
  - \$92.
  - \$90.
  - \$88.
31. A German citizen buys an automobile produced in the United States by a Japanese company. As a result,
- U.S. net exports increase, U.S. GNP and GDP are unaffected, Japanese GNP increases, German net exports decrease, and German GNP and GDP are unaffected.
  - U.S. net exports, GNP, and GDP increase, Japanese GDP increases, German net exports decrease, and German GDP is unaffected.
  - U.S. net exports and GDP increase, Japanese GNP increases, German net exports decrease, and German GDP and GNP are unaffected.
  - U.S. net exports, GNP, and GDP are unaffected, Japanese GNP increases, German net exports decrease, and German GDP and GNP fall.

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32. Jake loaned Elwood \$5,000 for one year at a nominal interest rate of 10 percent. After Elwood repaid the loan in full, Jake complained that he could buy 4 percent fewer goods with the money Elwood gave him than he could before he loaned Elwood the \$5,000. From this we can conclude that the rate of inflation during the year was
- 2.5 percent.
  - 6 percent.
  - 8 percent.
  - 14 percent.
33. In 2002, Freedonia had a population of 2,700 and real GDP of about 11,610,000. In 2001 it had a population of 2,500 and real-GDP of about 10,000,000. What was the approximate growth rate of real GDP per person in Freedonia between 2001 and 2002?
- 7.5 percent
  - 12.5 percent
  - 20.5 percent
  - 35.5 percent
34. Real GDP per person is \$21,000 in Aquilonia, \$15,000 in Nemedra and \$6,000 in Shem. Saving per person is \$2,000 in all three countries. Other things equal, we would expect that
- all three countries will grow at the same rate.
  - Aquilonia will grow the fastest.
  - Nemedra will grow the fastest.
  - Shem will grow the fastest.
35. If there is surplus of loanable funds, then
- the supply for loanable funds shifts right and the demand shifts left.
  - the supply for loanable funds shifts left and the demand shifts right.
  - neither curve shifts, but the quantity of loanable funds supplied increases and the quantity demanded decreases as the interest rate rises to equilibrium.
  - neither curve shifts, but the quantity of loanable funds supplied decreases and the quantity demanded increases as the interest rate falls to equilibrium.
36. An increase in the budget deficit would cause a
- shortage of loanable funds at the original interest rate, which would lead to falling interest rates.
  - surplus of loanable funds at the original interest rate, which would lead to rising interest rates.
  - shortage of loanable funds at the original interest rate, which would lead to rising interest rates.
  - surplus of loanable funds at the original interest rate, which would lead to falling interest rates.
37. You want to have \$100,000 in five years. If the interest rate is 8 percent, about how much do you need to save today?
- \$66,225.25
  - \$67,556.42
  - \$68,058.32
  - \$71,428.57
38. In 2000 in the United Kingdom, the adult population was about 46.5 million, the labor force participation rate was 63.5 percent, and the unemployment rate was 5.8 percent. What was the number of people employed and the number of people unemployed?
- about 29.5 million and 2.7 million.
  - about 29.5 million and 1.7 million.
  - about 27.8 million and 2.7 million.
  - about 27.8 million and 1.7 million.

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- \_\_\_\_\_ 39. The Fed can increase the price level by conducting open market
- sales and raising the discount rate.
  - sales and lowering the discount rate.
  - purchases and raising the discount rate.
  - purchases and lowering the discount rate.
- \_\_\_\_\_ 40. Assume that banks do not hold excess reserves. The banking system has \$50 million in reserves and has a reserve requirement of 10 percent. The public holds \$20 million in currency. Then the public decides to withdraw \$5 million in currency from the banking system. If the Fed wants to keep the money supply stable by changing the reserve requirement, then what will the new reserve requirement be?
- 10 percent
  - 9.1 percent
  - 9 percent
  - 8.1 percent
- \_\_\_\_\_ 41. When the money market is drawn with the value of money on the vertical axis, if the price level is above the equilibrium level, there is a
- shortage, so the price level will rise.
  - shortage, so the price level will fall.
  - surplus, so the price level will rise.
  - surplus, so the price level will fall.
- \_\_\_\_\_ 42. Which of the following is not implied by the quantity equation?
- If velocity is stable, an increase in the money supply creates a proportional increase in nominal output.
  - If velocity is stable and money is neutral, an increase in the money supply creates a proportional increase in the price level.
  - With constant money supply and output, an increase in velocity creates an increase in the price level.
  - With constant money supply and velocity, an increase in output creates a proportional increase in the price level.

Use the (hypothetical) information in the following table to answer the following questions.

Table 3

Country	Currency	Currency per U.S.Dollar	U.S. Price Index	Country Price Index
Brazil	Real	4.00	200	800
Japan	Yen	125.00	200	50,000
Mexico	Peso	10.00	200	2,000
Sweden	Krona	9.00	200	2,000
Thailand	Baht	45.00	200	8,000

- \_\_\_\_\_ 43. Refer to Table 3. For which country(ies) in the table does purchasing-power parity hold?
- Brazil and Mexico
  - Japan, Sweden, and Thailand
  - Japan and Sweden
  - Thailand
- \_\_\_\_\_ 44. In 1995 House Speaker Newt Gingrich threatened to send the United States into default on its debt. During the day of this announcement, U.S. interest rates rose and the real exchange rate of the U.S. dollar depreciated. Which of these changes is consistent with the results of the open-economy macroeconomic model?
- the increase in U.S. interest rates
  - the depreciation of the real exchange rate of the U.S. dollar
  - Both of the above are consistent.
  - Neither of the above are consistent.

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- \_\_\_\_\_ 45. An increase in the interest rate causes investment to
- rise and the exchange rate to appreciate.
  - fall and the exchange rate to depreciate.
  - rise and the exchange rate to depreciate.
  - fall and the exchange rate to appreciate.
- \_\_\_\_\_ 46. Suppose the economy is in long-run equilibrium. In a short span of time, there is a sharp increase in the minimum wage, a major new discovery of oil, a large influx of immigrants, and new environmental regulations that reduce electricity production. In the short run, we would expect
- the price level to rise and real GDP to fall.
  - the price level to fall and real GDP to rise.
  - the price level and real GDP both to stay the same.
  - All of the above are possible.
- \_\_\_\_\_ 47. The economy is in long-run equilibrium. Suppose that automatic teller machines become cheaper and more convenient to use, and as a result the demand for money falls. Other things equal, we would expect that in the short run,
- the price level and real GDP would rise, but in the long run they would both be unaffected.
  - the price level and real GDP would rise, but in the long run the price level would rise and real GDP would be unaffected.
  - the price level and real GDP would fall, but in the long run they would both be unaffected.
  - the price level and real GDP would fall, but in the long run the price level would fall and real GDP would be unaffected.
- \_\_\_\_\_ 48. The economy is in long-run equilibrium. Pessimism on the part of investors then shifts the aggregate demand curve \$50 billion to the left. The government wants to increase spending in order to avoid a recession. If the crowding-out effect is always half as strong as the multiplier effect, and if the  $MPC$  equals 0.9, by how much does government purchases have to rise?
- \$10 billion
  - \$50 billion
  - \$90 billion
  - \$100 billion
- \_\_\_\_\_ 49. Suppose a war disrupts the supply of oil to the country. We would expect the
- short-run aggregate supply curve, short-run Phillips curve, and long-run Phillips curve to shift left.
  - short-run aggregate supply curve, short-run Phillips curve, and long-run Phillips curve to shift right.
  - short-run aggregate supply curve to shift left, and the short-run Phillips curve and long-run Phillips curve to shift right.
  - short-run aggregate supply curve to shift left, the short-run Phillips curve to shift right, and the long-run Phillips curve to be unaffected.
- \_\_\_\_\_ 50. Suppose that a central bank is required to follow a monetary policy rule to stabilize prices. If the economy starts at long-run equilibrium and then aggregate demand shifts right, the central bank should
- increase the money supply, which causes output to move closer to its long-run equilibrium.
  - increase the money supply, which causes output to move farther from long-run equilibrium.
  - decrease the money supply, which causes output to move closer to its long-run equilibrium.
  - decrease the money supply, which causes output to move farther from long-run equilibrium.