

考試科目	經濟學	系所別	商學院共同科	考試時間	2月10日(四) 第二節
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I. Multiple Choice (1 point each)

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

- Suppose the demand function for a good is expressed as $Q = 200 - 4p$. If the good currently sells for \$30, then the price elasticity of demand equals
 - 1.
 - 1.5.
 - 4.
 - 6.67.
- If Andy likes broccoli (B) but hates cabbage (C), which of the following might best represent his utility function for broccoli and cabbage?
 - $U = B + C$
 - $U = \min\{B, C\}$
 - $U = U/C$
 - $U = B^{0.5}C^{0.5}$
- As the price of a Giffen good falls, the consumer will
 - purchase more units.
 - purchase fewer units.
 - not change the amount purchased.
 - There is not enough information to answer this question.
- What will happen to the equilibrium price of new textbooks if more students attend college, paper becomes more expensive, textbook authors accept lower royalties, and more used textbooks are sold?
 - Price will rise.
 - Price will fall.
 - Price will stay exactly the same.
 - The price change will be ambiguous.
- With capital on the vertical axis and labor on the horizontal axis, vertical isoquants imply that
 - capital and labor are perfect substitutes.
 - capital and labor must be used together in certain proportion.
 - capital is not productive.
 - labor is not productive.

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6. In a monopolistically competitive market, the entry of new firms will lead to the demand curve of an incumbent firm become
- steeper.
 - flatter.
 - remain the same.
 - none of the above.
7. Which of the following statement is wrong for an oligopolistic market?
- A firm in the market has a supply curve.
 - The market outcomes could be like a monopoly.
 - When the number of firms in the market getting large, this market will approach to a perfectly competitive market.
 - The owners of firm consider the output effect and the price effect when making production decisions.
8. Which of the following statement is wrong for a perfectly competitive market?
- Some firms might earn profit in the long run.
 - For a firm, average revenue equals marginal revenue.
 - When the fixed cost is zero, a firm will leave the market when it earns negative profit.
 - The market long-run supply curve is always horizontal at the price.
9. Which of the following statement is wrong?
- In a perfectly competitive market which all firms have the same cost structure, the firms will produce at the efficient scale in the long run.
 - Under the average cost pricing, a monopoly will not create deadweight losses.
 - A competitive market might not as efficient as a monopoly.
 - Price discrimination might create deadweight losses.
10. Consider the production possibilities frontier of two goods. Which of the following statement is wrong?
- A slope of the PPF measures the opportunity cost between the two goods that producers face.
 - The production point will not lie to the right of the PPF.
 - The consumption point will not lie to the right of the PPF.
 - The production point and the consumption point could be different points.

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11. After a certain nation changed its policy from one that banned international trade in wheat to one that allowed international trade in wheat, the nation began importing wheat. As a result, total surplus in the wheat market increased by \$10 million. Which of the following changes could have occurred as well?

- A. The price of wheat in that nation increased with the adoption of the new policy.
- B. The domestic quantity of wheat supplied increased with the adoption of the new policy.
- C. Consumer surplus in the wheat market increased by \$7 million and producer surplus in the wheat market increased by \$3 million.
- D. Consumer surplus in the wheat market increased by \$15 million and producer surplus in the wheat market decreased by \$5 million.

12. Which of the following events would be consistent with purchasing-power parity?

- A. The price level in the United States rises more rapidly than that in Ireland and the real exchange rate defined as Irish goods per unit of U.S. goods stays the same.
- B. The money supply in the United States rises more rapidly than in Egypt and the nominal exchange rate defined as Egyptian pounds per dollar falls.
- C. Earl, a worldwide traveler, looks at exchange rates and worldwide breakfast prices one morning and finds that whatever country he decides to go to he can convert \$15 into enough local currency to buy the same breakfast.
- D. All of the above are correct.

13. According to classical macroeconomic theory, in the long run

- A. monetary growth affects both real and nominal variables.
- B. the only real variable affected by monetary growth is the unemployment rate.
- C. a number of factors that affect unemployment are influenced by monetary growth.
- D. monetary growth affects nominal but not real variables.

14. Jennifer took out a fixed-interest-rate loan when the CPI was 100. She expected the CPI to increase to 103 but it actually increased to 105. The real interest rate she paid is

- A. higher than she had expected, and the real value of the loan is higher than she had expected.
- B. higher than she had expected, and the real value of the loan is lower than she had expected.
- C. lower than she had expected, and the real value of the loan is higher than she had expected.
- D. lower than she had expected, and the real value of the loan is lower than she had expected.

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<p>15. There is a temporary adverse supply shock. Given the effects of this shock, if the central bank chooses to return unemployment closer to its previous rate it would</p> <p>A. raise the rate at which it increases the money supply. In the long run this will shift the short-run Phillips curve right.</p> <p>B. raise the rate at which it increases the money supply. In the long run this will shift the short-run Phillips curve left.</p> <p>C. reduce the rate at which it increases the money supply. In the long run this will shift the short-run Phillips curve right.</p> <p>D. reduce the rate at which it increases the money supply. In the long run this will shift the short-run Phillips curve left.</p> <p>16. Which one of the following will increase the supply of money in the economy, everything else held constant?</p> <p>A. If the general public in the economy decides to hold more currency in the pockets.</p> <p>B. If the banking system decides to reduce the holding of excess reserves.</p> <p>C. The central bank sells bonds to the general public.</p> <p>D. The central bank sells its foreign currency reserves.</p> <p>17. Which one of the following is not considered to be “conventional monetary policy tool”?</p> <p>A. Open market operation.</p> <p>B. Reserve requirement ratio.</p> <p>C. Discount rate and lending.</p> <p>D. Large scale asset purchases.</p> <p>18. In the December 2021 statement, the FOMC “decided to keep the target range for the federal funds rate at 0 to 1/4 percent.” What is the federal funds rate?</p> <p>A. The interest rate anyone needs to pay to borrow money from the government.</p> <p>B. The interest rate banks receive by depositing money with the central bank.</p> <p>C. The interest rate banks pay to borrow money from the central bank.</p> <p>D. The interest rate banks pay to borrow money from other banks.</p> <p>19. Since 2014, the ECB has adopted a negative interest rate policy. What is the rate that is negative?</p> <p>A. The interest rate the ECB pays to banks for depositing money with the ECB.</p> <p>B. The interest rate that the ECB lends to banks.</p>					

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- C. The interest rate that the banks lend and borrow from other banks.
D. The rate of Eurodollar.

20. Everything else held constant, which of the following does not cause aggregate demand to increase?

- A. An increase in consumer spending.
B. An increase in investment spending.
C. An increase in taxes.
D. An increase in exports.

II. Problems and Short-essay Questions

Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.

1. Suppose that the inverse demand curve for paper is $p = 150 - Q$. Paper is produced with a constant marginal cost of 10. For simplicity, assume that there are no fixed costs. Producing paper creates pollution. Each unit of production generates an external cost of 80 to the residents who live near the paper mill(s).

A. (7 points) What are the equilibrium price, quantity and the associated deadweight loss if paper is produced by perfectly competitive firms?

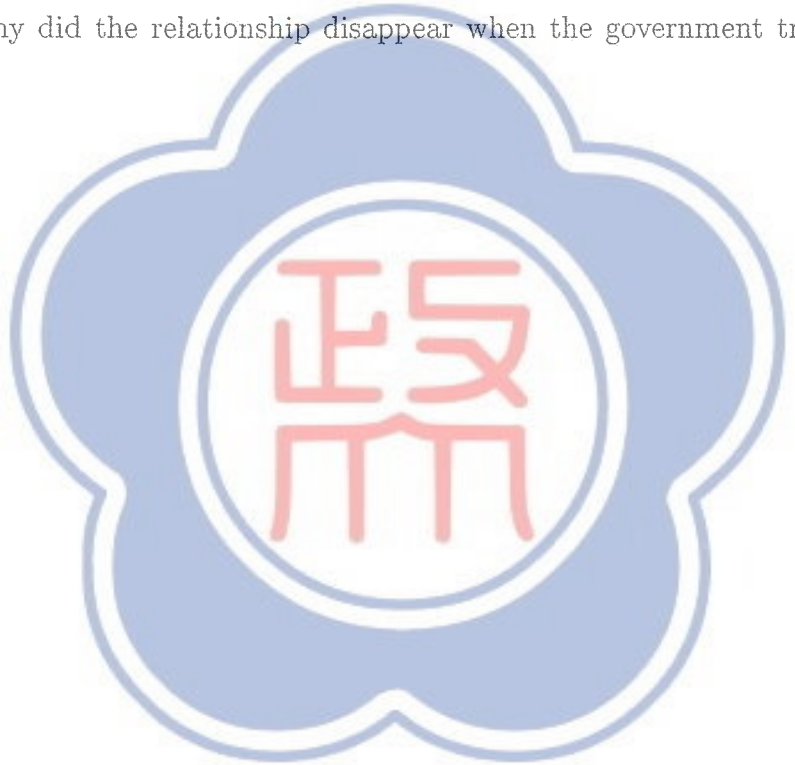
B. (7 points) What are the equilibrium price, quantity and the associated deadweight loss if paper is produced by a monopoly?

C. (6 points) Suppose the residents can costlessly negotiate with the monopoly. What is the equilibrium quantity of paper produced? What is the minimum monetary transfer from the residents to the monopoly that can achieve the social optimum?

2. Assume Taiwan is a small country and imports pork under free trade. The demand and supply are all linear. The consumers of Taiwan consume 1 million kilograms of pork per year. 400,000 of those are produced domestically and 600,000 are imported.

A. (10 points) Assume due to some reasons, the international price of pork falls by 100 dollars per kilogram. The consumers now consume 1.2 million kilograms of pork per year. 1 million of them are imported. Please calculate the welfare gain and the change of the producer surplus of the economy of Taiwan.

B. (10 points) If the government sets up a quota that only allows 400,000 kilograms of pork to be imported. After this policy, the price of pork in Taiwan rises by 150 dollars. Please calculate the deadweight loss for this policy.

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<p>3. Suppose Taiwan makes a decision to tax the import of agricultural products from abroad, but it does not decrease taxes or increase any other government spending to offset this tax revenues. Using diagrams and words, show and explain what happens to</p> <ul style="list-style-type: none">A. (12 points) national saving, domestic investment, net capital outflow and the interest rate;B. (4 points) the exchange rate; andC. (4 points) the amount of exports, imports and trade balance. <p>4. (20 points) Please explain, in words, why did the relationship of the Phillips curve exist in the past, and then why did the relationship disappear when the government tried to use it to boost the economy?</p> <div data-bbox="399 739 1197 1500" style="text-align: center;"></div>					
備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。				

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下表為中華民國 110 年 10 月底人口統計及第 3 季房價負擔能力指標。

縣市	戶量	人口數			性別比例	人口密度	房貸負擔率 (%)
		總計	男	女			
新北市	2.48	4,014,869	1,960,442	2,054,427	95.43	1,956.02	48.46
臺北市	2.40	2,538,299	1,208,385	1,329,914	90.86	9,338.86	63.35
桃園市	2.64	2,272,663	1,125,386	1,147,277	98.09	1,861.38	31.08
臺中市	2.77	2,815,477	1,382,072	1,433,405	96.42	1,271.15	41.10
臺南市	2.63	1,864,799	928,682	936,117	99.21	850.86	33.11
高雄市	2.44	2,749,293	1,355,140	1,394,153	97.20	931.38	31.22
宜蘭縣	2.59	451,175	227,222	223,953	101.46	210.47	35.54
新竹縣	2.73	574,806	293,417	281,389	104.27	402.66	34.50
苗栗縣	2.76	538,940	277,786	261,154	106.37	296.07	32.32
彰化縣	3.15	1,257,033	638,686	618,347	103.29	1,169.99	36.17
南投縣	2.70	485,983	248,298	237,685	104.47	118.35	35.00
雲林縣	2.74	671,182	346,966	324,216	107.02	519.96	28.02
嘉義縣	2.67	494,293	256,417	237,876	107.79	259.66	21.97
屏東縣	2.75	805,717	410,328	395,389	103.78	290.29	23.89
臺東縣	2.54	213,718	109,715	104,003	105.49	60.80	30.64
花蓮縣	2.52	321,971	162,726	159,245	102.19	69.56	33.86
澎湖縣	2.51	106,147	54,656	51,491	106.15	836.7	32.75
基隆市	2.34	364,766	181,861	182,905	99.43	2,747.58	23.06
新竹市	2.60	452,844	223,672	229,172	97.60	4,347.89	30.83
嘉義市	2.60	265,208	128,102	137,106	93.43	4,418.25	23.27
金門縣	3.32	141,180	70,367	70,813	99.37	930.92	n.a.
連江縣	3.86	13,516	7,822	5,694	137.37	469.31	n.a.

戶量=每戶平均人口數

性別比例=每百女子所當男子數

人口密度=每平方公里人口數

房貸負擔率=中位數住宅價格貸款月攤還額/中位數月家戶可支配所得

n.a.=無此資料

上表雖為全臺灣的資料，但依月、季會更新，以下問題請將此表的資料以「一組隨機樣本」視之，勿為「母體」資料。

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若需進行假設檢定，顯著水準皆設為 0.05。

- (15%) 繪製戶量的盒鬚圖 (box and whisker plot)，並判斷那些縣市為可能的離群值。必須清楚說明、計算圖形所需之統計量與統計值，及定義離群值判斷之準則。
- (15%) 若房貸負擔率 $< 30\%$ 表示可合理負擔， $30\% \leq$ 房貸負擔率 $< 40\%$ 表示房價負擔能力略低，房貸負擔率 $\geq 40\%$ 表示房價負擔能力偏低。假設隨機變數 H 為房價負擔能力程度，定義其值： $h=1$ 為合理負擔， $h=2$ 為房價負擔能力略低， $h=3$ 為房價負擔能力偏低。
 - 計算隨機變數 H 之機率分配函數。(5%)
 - 計算隨機變數 H 的期望值與變異數。(10%)
- (35%) 假設性別比例為常態分配，回答以下問題。
 - 計算性別比例之母體均數的 95% 信賴區間估計。(7%)
 - 假設六都與非六都縣市之性別比例之母體變異數相等。檢定六都與非六都的縣市之性別比例之母體平均數是否相等。(10%)
 - 續題 2。若 μ_h 為 $H=h$ ($h=1,2,3$) 所對應的縣市之性別比例之母體均數，檢定 $H_0: \mu_1 = \mu_2 = \mu_3$ ， H_1 : 至少一個 μ_h 是不等。(14%)
 - 詳述執行小題(3)之檢定程序所需的假設。(4%)
- (15%) 以房貸負擔率作為反應變數 (response variable)，其他皆為解釋變數進行迴歸模型分析，得到以下參數估計結果：

	Estimate	Std error
(Intercept)	-97.8867	43.5739
人口密度	-0.0009	0.0010
人口數 總計	0.0005	0.0001
人口數 男	-0.0010	0.0002
人口數 女	NA	NA
性別比例	0.6112	0.4241
戶量	27.5628	8.0875

- 參數估計表中之「NA」表示其估計結果是不可得到的；詳述「人口數 女」的參數估計結果為「NA」之原因。(5%)
- 檢定各解釋變數之顯著性，並決定那些變數可排除在模型中。(10%)

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5. (20%) 依題 4 的迴歸模型分析，得到以下變異數分析 (Analysis of variance, ANOVA) 表：

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Regression	(1)	(4)	(6)	(8)
Error	(2)	245.43	(7)	
Total	(3)	(5)		

(1) 寫出 ANOVA 表中(1)至(8)的值。(10%)

(2) 計算判定係數 R^2 及調整判定係數 R_a^2 ，並詳述兩者之意義與差異。(10%)

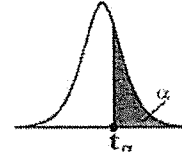
F - Distribution ($\alpha = 0.05$ in the Right Tail)

df ₂	Numerator Degrees of Freedom								
	1	2	3	4	5	6	7	8	9
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385
3	10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123
4	7.7086	9.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	6.9988
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767
8	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881
9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789
10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144
14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458
15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876
16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377
17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943
18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563
19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227
20	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928
21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660
22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419
23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201
24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002
25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821
26	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655
27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501
28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360
29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107
40	4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401
120	3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588
∞	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799

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t 分配表

Percentage Points of the *t* Distribution; $t_{v, \alpha}$
 $P(T > t_{v, \alpha}) = \alpha$



v	α													
	0.40	0.30	0.20	0.15	0.10	0.05	0.025	0.02	0.015	0.01	0.0075	0.005	0.0025	0.0005
1	0.325	0.727	1.376	1.963	3.078	6.314	12.706	15.895	21.205	31.821	42.434	63.657	127.322	636.590
2	0.289	0.617	1.061	1.386	1.886	2.920	4.303	4.849	5.643	6.965	8.073	9.925	14.089	31.598
3	0.277	0.584	0.978	1.250	1.638	2.353	3.182	3.482	3.896	4.541	5.047	5.841	7.453	12.924
4	0.271	0.569	0.941	1.190	1.533	2.132	2.776	2.999	3.298	3.747	4.088	4.604	5.598	8.610
5	0.267	0.559	0.920	1.156	1.476	2.015	2.571	2.757	3.003	3.365	3.634	4.032	4.773	6.869
6	0.265	0.553	0.906	1.134	1.440	1.943	2.447	2.612	2.829	3.143	3.372	3.707	4.317	5.959
7	0.263	0.549	0.896	1.119	1.415	1.895	2.365	2.517	2.715	2.998	3.203	3.499	4.029	5.408
8	0.262	0.546	0.889	1.108	1.397	1.860	2.306	2.449	2.634	2.896	3.085	3.355	3.833	5.041
9	0.261	0.543	0.883	1.100	1.383	1.833	2.262	2.398	2.574	2.821	2.998	3.250	3.690	4.781
10	0.260	0.542	0.879	1.093	1.372	1.812	2.228	2.359	2.527	2.764	2.932	3.169	3.581	4.587
11	0.260	0.540	0.876	1.088	1.363	1.796	2.201	2.328	2.491	2.718	2.879	3.106	3.497	4.437
12	0.259	0.539	0.873	1.083	1.356	1.782	2.179	2.303	2.461	2.681	2.836	3.055	3.428	4.318
13	0.259	0.538	0.870	1.079	1.350	1.771	2.160	2.282	2.436	2.650	2.801	3.012	3.372	4.221
14	0.258	0.537	0.868	1.076	1.345	1.761	2.145	2.264	2.415	2.624	2.771	2.977	3.326	4.140
15	0.258	0.536	0.866	1.074	1.341	1.753	2.131	2.249	2.397	2.602	2.746	2.947	3.286	4.073
16	0.258	0.535	0.865	1.071	1.337	1.746	2.120	2.235	2.382	2.583	2.724	2.921	3.252	4.015
17	0.257	0.534	0.863	1.069	1.333	1.740	2.110	2.224	2.368	2.567	2.706	2.898	3.222	3.965
18	0.257	0.534	0.862	1.067	1.330	1.734	2.101	2.214	2.356	2.552	2.689	2.878	3.197	3.922
19	0.257	0.533	0.861	1.066	1.328	1.729	2.093	2.205	2.346	2.539	2.674	2.861	3.174	3.883
20	0.257	0.533	0.860	1.064	1.325	1.725	2.086	2.197	2.336	2.528	2.661	2.845	3.153	3.850
21	0.257	0.532	0.859	1.063	1.323	1.721	2.080	2.189	2.328	2.518	2.649	2.831	3.135	3.819
22	0.256	0.532	0.858	1.061	1.321	1.717	2.074	2.183	2.320	2.508	2.639	2.819	3.119	3.792
23	0.256	0.532	0.858	1.060	1.319	1.714	2.069	2.177	2.313	2.500	2.629	2.807	3.104	3.768
24	0.256	0.531	0.857	1.059	1.318	1.711	2.064	2.172	2.307	2.492	2.620	2.797	3.091	3.745
25	0.256	0.531	0.856	1.058	1.316	1.708	2.060	2.167	2.301	2.485	2.612	2.787	3.078	3.725
26	0.256	0.531	0.856	1.058	1.315	1.706	2.056	2.162	2.296	2.479	2.605	2.779	3.067	3.707
27	0.256	0.531	0.855	1.057	1.314	1.703	2.052	2.158	2.291	2.473	2.598	2.771	3.057	3.690
28	0.256	0.530	0.855	1.056	1.313	1.701	2.048	2.154	2.286	2.467	2.592	2.763	3.047	3.674
29	0.256	0.530	0.854	1.055	1.311	1.699	2.045	2.150	2.282	2.462	2.586	2.756	3.038	3.659
30	0.256	0.530	0.854	1.055	1.310	1.697	2.042	2.147	2.278	2.457	2.581	2.750	3.030	3.646
40	0.255	0.529	0.851	1.050	1.303	1.684	2.021	2.123	2.250	2.423	2.542	2.704	2.971	3.551
60	0.254	0.527	0.848	1.045	1.296	1.671	2.000	2.099	2.223	2.390	2.504	2.660	2.915	3.460
120	0.254	0.526	0.845	1.041	1.289	1.658	1.980	2.076	2.196	2.358	2.468	2.617	2.860	3.373
∞	0.253	0.524	0.842	1.036	1.282	1.645	1.960	2.054	2.170	2.326	2.432	2.576	2.807	3.291

備

註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。

考試科目	管理學	系所別	企業管理研究所(MBA學位學程)	考試時間	2月10日(四)第4節
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一、(25%) 因應 Covid-19 疫情擴大，政府成立嚴重特殊傳染性肺炎中央流行疫情指揮中心，請回答以下二個問題。

1. (16%) 請以中央流行疫情指揮中心為例分述具體說明管理的四大功能如何發揮運作。
2. (9%) 管理者主要需具備哪三項重要的管理能力？請列點分述中央疫情指揮中心、地方政府、基層醫療院所分別須著重何項管理能力？

二、(25%) 波特五力模型 (five forces model) 時常被運用來進行策略外部分析，請回答以下二個問題。

1. (20%) 試舉一例運用波特五力模型分項列點進行分析。
2. (5%) 請說明分析的結果對企業的管理意涵。

三、(30%) 組織設計主要涉及六個重要元素的決策，請回答以下二個問題。

1. (18%) 請列出並說明此六項重要組織設計的決策面向為何。
2. (12%) 定義有機式組織與機械式組織，並說明影響採用兩種不同形式組織設計的可能權變因素。

四、(20%) 企業在投入於招募、甄選、講習、及訓練員工後，最擔心的事情之一是培訓好的優秀人才離開公司，請回答以下二個問題。

1. (15%) 請從激勵的不同面向觀點試舉三個激勵理論，說明優秀人才的離開，分別是甚麼不同的因素所導致。
2. (5%) 若要避免有能力與經驗的優秀人才離開公司，建議管理者採用甚麼方式領導？請舉一個領導相關的理論說明你的觀點。

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。
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考試科目	微積分	系所別	企業管理研究所 B組	考試時間	2月10日(四)第四節
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請詳述解題過程，無過程者不予計分。

(1) Either find the limit or explain why it does not exist.

(a) (5 points) $\lim_{x \rightarrow 0^+} x^3 \sin\left(\frac{1}{x}\right)$

(b) (5 points) $\lim_{x \rightarrow 0} \frac{x}{|x|}$

(2) Evaluate the integral.

(a) (15 points) $\int_0^1 \frac{x}{\sqrt{1+2x}} dx$

(b) (15 points) $\int_{-\infty}^{\infty} x^2 e^{-x^2/2} dx$

(3) Determine whether each of the following series is convergent or divergent

(a) (10 points) $\sum_{n=3}^{\infty} \frac{\ln(n)}{n^2}$

(b) (10 points) $\sum_{n=1}^{\infty} \frac{(-3)^n}{n!}$

(4) Let $f(x) = \left| e^{(x-1)^3+1} - 1 \right|$.

(a) (5 points) Find all relative maxima and relative minima of $f(x)$.

(b) (10 points) Is $(1, e-1)$ an inflection point of $f(x)$? Justify your answer.

(c) (10 points) Find the horizontal asymptote of the graph of $f(x)$.

(5) (15 points) Evaluate the integral $\iint_{\Omega} \left(\frac{1}{2}xy^2\right) dA$ where Ω is the region bounded

by the line $y = x - 1$ and the parabola $y^2 = 2x + 6$ (i.e. $\Omega = \{(x, y) \mid y \geq x - 1 \text{ and } 2x + 6 \geq y^2\}$).

備註

一、作答於試題上者，不予計分。
二、試題請隨卷繳交。