

**2020학년도  
아주대학교 편입학 수강능력시험**

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<b>성명</b>	
<b>전형</b>	
<b>수험번호</b>	

Questions 1-2: Choose the word that best completes the sentence.

1. (0.8 points) When we are slightly distracted by the noise around us— as we are at a cafe, for example— it can actually improve our performance of certain activities. It helps us process information more abstractly, which can \_\_\_\_\_ our creativity.

- ① diminish
- ② dismiss
- ③ enhance
- ④ entertain
- ⑤ enchant

2. (0.8 points) \_\_\_\_\_ crimes, also known as incomplete crimes, are acts taken toward committing a crime or acts that constitute indirect participation in a crime. Although these acts are not themselves crimes, they are illegal because they are conducted in furtherance of a crime, and society wishes to deter individuals from taking such steps.

- ① Inchoate
- ② Rudimentary
- ③ Full-fledged
- ④ Incoherent
- ⑤ Fundamental

Questions 3-4: Choose the underlined word or phrase that must be changed for the sentence to be correct.

3. (1.0 points) Conservatives viewed equality ①as another pernicious abstraction that ②was contradicted all historical experience. For conservatives, society was naturally hierarchical, and ③they believed that some men by virtue of their intelligence, education, wealth, and birth ④were best qualified to rule and instruct ⑤the less able.

4. (0.8 points) It is specifically the increase ①in the number of hostile takeovers that is important in our context. ②The question of what the dominant FIGHT metaphor reinforced aggressive business practices or vice versa is a very chicken-and-egg problem, but ③it is safe to say that the socio-economic framework ④sketched above did not exactly discourage conceptual models of aggression ⑤either.

Questions 5-7: Choose the expression that best completes the sentence.

5. (1.0 points) Developing more effective treatments \_\_\_\_\_ by the large size of the inhaled drug particles that fail to reach the deep lung.

- ① has limited
- ② has been limited
- ③ have been limited
- ④ have limited
- ⑤ limited

6. (1.0 points) \_\_\_\_\_ Beirut or Bahrain, or even Detroit, you can write a musical prescription for whatever the condition is of the environment that you find yourself in.

- ① Whether it be
- ② What be it
- ③ Whether be it
- ④ What it be
- ⑤ Which be it

7. (1.0 points) It seems to be related to \_\_\_\_\_ the people were participating in the program.

- ① extent to which
- ② extent which to
- ③ extent the which to
- ④ the extent which to
- ⑤ the extent to which

Questions 8–9: Choose the number with a correct set of statements that can be restated or inferred from the original text.

8. (1.1 points) In 2009, when the White House was preparing to pour 33,000 more troops into Afghanistan, Lt. Col. Brett Jenkinson's men were fighting for their lives in the Korengal Valley. Their mission at the time was to build a road into an area where locals hated the Afghan government and prized their isolation. Jenkinson told his bosses that U.S. troops should abandon the mission, which claimed many lives. Jenkinson's experience should have inspired humility and caution. Instead, Jenkinson's soldiers were reinforced by a new unit and two more U.S. soldiers and dozens of Afghans were killed there.

- (a) Jenkinson's opinions created humility and caution.
- (b) Many people were sacrificed during the construction of a road.
- (c) The White House believed that more troops should be deployed to Afghanistan.
- (d) Jenkinson succeeded in persuading his bosses to give up the mission to build a road.

- ① (a) & (b)
- ② (b) & (c)
- ③ (a) & (c)
- ④ (a), (c) & (d)
- ⑤ (b), (c) & (d)

9. (1.1 points) The anthropocene is no time to set things straight. The recognition that human activity has altered the planet on the scale of a geological epoch muddles the commonsensical assumption that the world exists as a background for the human subject. New materialisms, insisting on the agency and significance of matter, maintain that even in the anthropocene, or, especially in the anthropocene, the substance of what was once called "nature," acts, interacts, and even intra-acts within, through, and around human bodies and practices. What can it mean to be human in this time when the human is something that has become sedimented in the geology of the planet?

- (a) The anthropocene is a term that refers to the unprecedented geological transformation on earth.
- (b) New materialists deny that only humans are capable of performing meaningful activities and interactions.
- (c) According to new materialisms, the old definition of the human subject becomes obsolete.
- (d) Reestablishing the authority of the human subject is required to alter the earth.

- ① (a) & (b)
- ② (b) & (c)
- ③ (b) & (d)
- ④ (a), (b), & (c)
- ⑤ (b), (c), & (d)

Questions 10-25: Read each passage and answer the corresponding questions for each.

※ Questions 10 through 13 are based on the following passage.

[A] Historians have often seen 1898 as a clear departure from the past, the point of American emergence into world politics. Yet the extent of change can be exaggerated. There was not a sudden increase of American might; since industrialization, the U.S. had been a potential great power. Nor did 1898 mark a sudden, permanent shift in popular interest. After a flurry of arguments over imperialism, most Americans resumed, in the early twentieth century, their habitual concentration on home affairs. However, 1898 did mark a change in American commitments. From this point on, both the U.S. and the European powers assumed that America had some interest in world crises.

[B] Many reasons have been given for this change. (1) \_\_\_\_\_: the American economy had reached maturity and therefore America, like other advanced industrial countries, needed new raw materials and foreign markets. Many historians would deny any connection between American expansion abroad and internal American economic development. This connection, however, was frequently made by turn-of-the-century farmers and businessmen, who saw a relationship between domestic prosperity and foreign markets.

[C] A second explanation for the new departures in foreign policy was the revival and restatement of the traditional idea of America's "manifest destiny" of expansion. However, the change from continental to overseas expansionism needed new justification. One of the most common arguments of late nineteenth-century expansionists was the idea of Anglo-Saxon "racial" superiority. In the 1890's, some claimed superiority over southern African-Americans and new immigrants.

[D] Another less obvious cause of the change in American policy was the actual situation in great power politics. The imperial activities of the major European nations already engaged in a scramble for territory and influence in the world's underdeveloped regions (2) \_\_\_\_\_ the American appetite for expansion. Having divided up Africa, the European powers were now eyeing the last two remaining areas for expansion: the Near East and the Far East. Each of these were too important to fall to any single power so the leading nations uneasily supported the independence of both, staking out spheres of economic influence. Everywhere the situation was fluid and dangerous. When a country with a potential might of the U.S. showed an interest in world politics, the country was inevitably seen as a menace by some powers and as a potential ally by others. What happened in 1898 reflected all these forces. Against its will and without quite realizing it, the U.S. became involved in great power politics.

10. (1.1 points) Which of the following would be the best title for the above passage?

- ① America' s Overseas Expansion
- ② Forerunner of American Adventures
- ③ Peace and Empire in the U.S.
- ④ The Perils of American Imperialism
- ⑤ The Mature Economy of America

11. (1.1 points) Which of the following would best fit in the blank (1) in paragraph [B]?

- ① The public felt that the U.S. had a special interest in the western hemisphere.
- ② Most believed that American freedom from foreign dangers was permanent and natural.
- ③ Some of the doctrines were advocated with great force by a group of able young men.
- ④ The most obvious suggestion embodies the traditional economic interpretation of imperialism.
- ⑤ Once colonial expansion was completed, public interest in foreign affairs concentrated on traditional concerns.

12. (0.8 points) Which of the following can be inserted into the blank (2) in paragraph [D]?

- ① whetted
- ② grieved
- ③ vindicated
- ④ dangled
- ⑤ usurped

13. (1.0 points) According to the above passage, which of the following is true?

- ① Historians have claimed that the year 1898 marks a division in American foreign policy.
- ② The year 1898 witnessed a sudden change in American people' s interest.
- ③ European nations ceased to support the independence of the countries in the Near East and the Far East.
- ④ The idea of Anglo-Saxon racial superiority was denied in the 1890' s.
- ⑤ Many historians believed that American overseas expansion was related to its economic crises.

※ Questions 14 through 17 are based on the following passage.

[A] As anyone who has tried to build a smart home can attest, getting all of your speakers and devices to work together is no easy task. A new alliance (a) spearheaded by Amazon, Apple, and Google hopes to fix that once and for all. Called Project Connected Home over IP (CHoIP), the goal is one that has (b) eluded the smart home space since its inception: to enable communication across smart home devices, mobile apps, and cloud services and to define a specific set of IP-based networking technologies for device certification. As it stands, device makers need to choose which protocol and smart assistant to support from the outset, so naturally, the landscape (1) \_\_\_\_\_. For example, the popular Ring Doorbell doesn't work with Siri, and the Nest x Yale lock doesn't support Amazon Alexa.

[B] The new alliance understands those frustrations and seeks to solve them with the adoption of a new, royalty-free connectivity standard to increase compatibility among smart home products, with security as a fundamental design (c) tenet. That sounds like a pie-in-the-sky fantasy, and without all of the major players on board, it is easy to dismiss as another forgotten project with (d) lofty ambitions. However, everyone is on board, not just Apple, Google, and Amazon, but also Zigbee, IKEA, Samsung, and even NXP, which makes chips for everything from Roombas to iPhones. So it has a very real chance of success.

[C] The focus of the project is obviously on new products, so (2) \_\_\_\_\_. However, starting in late 2020, CHoIP hopes to release a preliminary reference open-source implementation developed and maintained on GitHub. That means device makers will have a single standard that replaces Amazon's Alexa Smart Home, Apple's HomeKit, and Google's Weave data models into a single protocol that works across all platforms.

[D] While CHoIP specifically says it does not intend to standardize smart home user interfaces such as voice assistants, smart displays, or desktop and mobile apps, the advancement of a single protocol will clearly benefit all of these things. With a single open standard in play, devices will be as platform-friendly as a USB, with relatively minor adjustments needed to support all three major assistants. An industry-wide partnership could also (e) beef up security. Since the standard will be built on IP, end-to-end security is built in by default. To ensure adoption, the project will define a specific set of IP-based networking technologies for device certification, which should help mitigate hacks like the one recently (3) \_\_\_\_\_ by a Calabasas, Calif., family.



14. (1.1 points) Which of the following would be the best title for the above passage?
- ① Apple Stands to Benefit the Most from the New Project
  - ② Two-factor Authentication Will be Included in a Single Standard
  - ③ Alexa, Siri, and Google Assistant Might Soon All Speak the Same Smart Home Language
  - ④ Siri Seriously Lags Behind Both Alexa and Google Assistant in the Number of Supported Devices
  - ⑤ The Choice Between Which Smart Device to Buy Won't Come Down to Which Smart Speaker You Have
15. (0.8 points) Which of the following pairs includes an expression that CANNOT replace the underlined expression in the passage?
- ① (a) spearheaded, led
  - ② (b) eluded, evaded
  - ③ (c) tenet, principle
  - ④ (d) lofty, humble
  - ⑤ (e) beef up, boost
16. (1.0 points) Which of the following pairs would best fit in the blanks (1) and (3) to make the flow of the argument acceptable?
- ① extremely fractures – experience
  - ② is extremely fractured – experience
  - ③ is extremely fractured – experienced
  - ④ is extremely fractured – experiencing
  - ⑤ extremely fractures – be experienced
17. (1.1 points) Which of the following would best fit in the blank (2) in paragraph [C]?
- ① individual accounts would tie into the new standard.
  - ② a homeowner can tell when each member of the family came in.
  - ③ the biggest benefit of electronic systems is that they are highly configurable.
  - ④ anything in your home now will not be magically reconnected to fit into the new standard.
  - ⑤ it has been pretty tough to replace a system that has worked reasonably reliably for a long time.

※ Questions 18 through 21 are based on the following passage.

[A] Many interpreters argue that (1) the most likely scenario has wolf wannabe dogs (a) first taking advantage of the calorie bonanzas provided by humans' waste dumps. By their opportunistic moves, those emergent dogs would be behaviorally and ultimately genetically adapted for reduced tolerance distances, less hair-trigger flight, puppy developmental timing with longer windows for cross-species socialization, and more confident parallel occupation of areas also occupied by dangerous humans.

[B] Studies of Russian fur foxes selected over many generations for differential tameness show many of the morphological and behavioral traits associated with domestication. These foxes might model the emergence of a kind of proto- "village dog," genetically close to wolves but (b) behaviorally quite different from and receptive to human attempts to further the domestication process. Both by deliberate control of dogs' reproduction and by unintended but nonetheless potent consequences, humans could have contributed to shaping the many kinds of dogs that appeared early in the story. Human life ways changed significantly in association with dogs. Flexibility and opportunism are the name of the game for both species, who shape each other throughout the still ongoing story of co-evolution.

[C] Scholars use versions of this story to question sharp divisions of nature and culture in order to shape a more generative discourse for technoculture. Darcy Morey believes that the distinction between artificial and natural selection is empty because all the way down the story is about differential reproduction. Ed Russell, an environmental historian, argues that the evolution of dog breeds is a chapter in the history of biotechnology. He emphasizes human agencies and regards organisms as engineered technologies, but (c) in a way that has the dogs active, as well as in a way to foreground the ongoing co-evolution of human cultures and dogs.

[D] Co-evolution has to be defined more broadly than (d) biologists habitually do. Certainly, the mutual adaptation of visible morphologies like flower sexual structures and the organs of their pollinating insects is co-evolution. But it is a mistake to see the alterations of dogs' bodies and minds as biological and the changes in human bodies and lives as cultural, and so not about co-evolution. At the least, I suspect that human genomes contain a considerable molecular record of the pathogens of their companion species, including dogs. Immune systems are not a minor part of nature cultures; they determine (e) where organisms, including people, can live and with whom. The history of the flu is unimaginable without the concept of the co-evolution of humans, pigs, fowl, and viruses.

18. (1.0 points) Which of the following is the best title for the above passage?

- ① The Conflicted Evolutionary Theory of Dogs
- ② The Domestication of Animals and Its Influence on Culture
- ③ The Interaction Between Nature and Culture in Co-evolution
- ④ Immunity of Human Culture in Evolutionary Theory
- ⑤ Co-evolutionary Factors Alter Dogs' Biology

19. (1.1 points) Choose the underlined phrase that must be changed for the sentence to be grammatically correct.

- ① (a) first taking advantage of the calorie bonanzas
- ② (b) behaviorally quite different from and receptive to human attempts
- ③ (c) in a way that has the dogs active
- ④ (d) biologists habitually do
- ⑤ (e) where organisms, including people, can live and with whom

20. (1.0 points) According to the passage, which of the following is NOT true?

- ① Disease is a matter not only of biology but of sociology.
- ② The weaning period of a wolf is shorter than that of a dog.
- ③ Domestication is an emergent process of co-habiting, involving agencies of many sorts.
- ④ Human genes have been altered by organisms causing disease in the companion species.
- ⑤ There is a dispute whether dogs are genetically closer to Russian fur foxes than to wolves.

21. (1.1 points) Which of the following best explains the scenario in the underlined (1) the most likely scenario in paragraph [A]?

- ① the best way to settle the dispute about dogs' origin
- ② the most interesting movie script about dogs
- ③ the most convincing story about the influence of biology on culture
- ④ the most useful ways to train the wolf into the dog
- ⑤ the most plausible story about how the dog first emerged

※ Questions 22 through 25 are based on the following passage.

[A] In the type of liberal society that aspires to justice and equal opportunity for all, there are two tasks for the political cultivation of emotion. One is to engender and sustain strong commitment to worthy projects that require effort and sacrifice— such as social redistribution, the full inclusion of previously excluded or marginalized groups, the protection of the environment, foreign aid, and the national defense. Most people tend toward narrowness of sympathy. They can easily become immured in narcissistic projects and forget about the needs of those outside their narrow circle. Emotions directed at the nation and its goals are frequently of great help in getting people to think larger thoughts and recommit themselves to a larger common good.

[B] The other related task for the cultivation of public emotion is to keep at bay forces that lurk in all societies and, ultimately, in all of us: tendencies to protect the fragile self by denigrating and subordinating others. Disgust and envy, the desire to inflict shame on others— all of these are present in all societies and in every individual human life. Unchecked, they can inflict great damage. (a) The damage they do is particularly great when they are relied upon as guides in the process of lawmaking and social formation.

[C] Great democratic leaders, in many times and places, have understood the importance of cultivating appropriate emotions and discouraging those that obstruct society’ s progress toward its goals. Liberal political philosophy, however, has said little about the topic. John Locke, defending religious toleration, acknowledged a problem of wide-spread animosity between members of different religions in the England of his time; he urged people to take up attitudes of “charity, bounty, and liberality” and recommended that churches advise their members of “the duties of peace and good-will towards all men, as well towards the erroneous as the orthodox.”

[D] Locke made no attempt, however, to delve into the psychological origins of intolerance. He thus gave little guidance about the nature of the bad attitudes and how they might be combated. Nor did he recommend any official public steps to shape psychological attitudes. The cultivation of good attitudes is left to individuals and to churches. Given that it was precisely in churches that the bad attitudes festered, Locke leaves his own project in a fragile and uncertain position. In his view, however, the liberal state should confine itself to protecting people’ s rights to property and other political goods, when and if others assail them. In terms of his own argument, which grounds religious toleration in equal natural rights, this is intervention one step too late.

22. (1.0 points) Which of the following is the best title for the above passage?

- ① The Unexpected Effects of Narrow Sympathy on the Public Goal
- ② How to Cultivate Political Emotions in the Liberal Society
- ③ The Role of Political Emotions in Sustaining a Good Liberal Society
- ④ Narcissism in Human Nature Against the Liberal Society
- ⑤ The Liberal Political Philosophy and John Locke' s Theory of Emotion

23. (1.1 points) According to the passage, which of the following is NOT true?

- ① Locke admitted that the right emotions contribute to the establishment of a decent society.
- ② Liberal political philosophers wanted to limit the intervening role of government as strictly as possible.
- ③ Patriotism sometimes helps people overcome their selfishness and widen their sympathetic feelings to include a large group of people.
- ④ In Locke' s times, religious factions in England were the source of intense conflict, spreading the culture of hostility.
- ⑤ Locke believed that churches and government should be partners in cultivating citizens' toleration towards others.

24. (1.1 points) Which of the following is the best example of *the great damage* in (a) The damage they do is particularly great when they are relied upon as guide in the process of lawmaking and social formation in paragraph [B]?

- ① The government promotes civil religion that encourages altruistic motivation in its citizens.
- ② The antagonism between two opposing political parties makes it impossible to reach a compromise agreement on a certain issue.
- ③ The statistical finding that one group of people are less capable of accomplishing a certain task is used as a valid reason for treating these people in a discriminatory way.
- ④ The disgust that people feel for a group of other people is used as a valid reason for treating these people in a discriminatory way.
- ⑤ A younger generation inherits the hatred that an older generation had towards one group of people.

25. (1.0 points) Which of the following CANNOT be inferred from the above passage?

- ① Emotions can support the basic principles of the political culture of an aspiring yet imperfect society.
- ② The goal of politics in political liberalism of the past is to protect individual freedom rather than to implement justice and equality.
- ③ Human beings tend to prioritize the preservation of the self over the care for others.
- ④ The writer of the above passage believes that Locke's theory has limitations that need to be corrected with more emphasis on the role of emotions.
- ⑤ Cultivation of politically appropriate emotions leads to the suppression of negative emotions, which will ensure equality for all.

※ (문제 26-47) 다음 물음에 답하라.

26. [0.8점]  $\sin\left(2\cos^{-1}\left(\frac{3}{5}\right)\right) - \cos\left(2\tan^{-1}\left(\frac{4}{3}\right)\right)$ 의 값은?

- ①  $-\frac{31}{25}$       ②  $-\frac{17}{25}$       ③  $\frac{13}{25}$       ④  $\frac{17}{25}$       ⑤  $\frac{31}{25}$

27. [0.8점] 다음 극한의 값은?

$$\lim_{x \rightarrow \infty} \frac{x^{-\frac{5}{4}}}{\sin\left(\frac{1}{x}\right)}$$

- ①  $-\frac{5}{4}$       ②  $-1$       ③  $\frac{5}{4}$       ④  $1$       ⑤  $0$

28. [0.8점] 실수 전체에서 정의된 미분가능 함수  $f$ 에 대하여  $g(x) = \sqrt{3e^x + (f(x))^2}$ 라 하자.  
 $f(0) = 1$ ,  $f'(0) = -5$ 이면,  $g'(0)$ 의 값은?

- ①  $-\frac{9}{4}$       ②  $-\frac{7}{4}$       ③  $1$       ④  $\frac{7}{4}$       ⑤  $\frac{9}{4}$

29. [1.0점] 곡선  $y = \ln(\sin(x))$  ( $\frac{\pi}{6} \leq x \leq \frac{\pi}{2}$ )의 길이를 구하면?

- ①  $\ln(2 - \sqrt{3})$       ②  $\ln(2 + \sqrt{3})$       ③  $\ln(\sqrt{2} - 1)$   
 ④  $1$       ⑤  $\ln(\sqrt{2} + 1)$

30. [1.1점] 멱급수  $\sum_{n=1}^{\infty} (-1)^n \frac{2^n n!}{n^n} x^n$ 의 수렴 반경은?

- ①  $1$       ②  $\frac{1}{e}$       ③  $e$       ④  $\frac{2}{e}$       ⑤  $\frac{e}{2}$

31. [1.1점] 다음 <보기>에서 수렴하는 이상 적분은 모두 몇 개인가?

<보기>

가. $\int_1^{\infty} \frac{\sin x}{x} dx$	나. $\int_0^1 \frac{\sqrt{x}}{\sin x} dx$
다. $\int_0^1 \frac{1}{\ln(2x)} dx$	라. $\int_0^1 \frac{1}{x(\ln(2x))^2} dx$

- ① 0개      ② 1개      ③ 2개      ④ 3개      ⑤ 4개

32. [0.8점] 뉴턴의 냉각법칙에 의하면 물체의 냉각속도는 물체의 온도와 주변온도의 차에 비례한다. 주변온도가  $20^{\circ}\text{C}$ 로 일정할 때,  $80^{\circ}\text{C}$ 인 커피가 1분 후에  $50^{\circ}\text{C}$ 로 식었다. 1분이 더 지났을 때의 커피의 온도는?

- ①  $40^{\circ}\text{C}$       ②  $35^{\circ}\text{C}$       ③  $30^{\circ}\text{C}$   
 ④  $25^{\circ}\text{C}$       ⑤  $20^{\circ}\text{C}$

33. [1.1점] 아래 초깃값 문제의 해가  $y$ 일 때  $y(2)$ 의 값은 얼마인가?

$$\begin{cases} y' + \frac{4}{x}y = x^3 y^2 \\ y(1) = \frac{1}{1 + \ln 2} \end{cases}$$

- ①  $-\frac{1}{32}$       ②  $-\frac{1}{8}$       ③  $-\frac{1}{4}$       ④  $\frac{1}{32}$       ⑤  $\frac{1}{16}$

34. [1.0점] 함수  $f(x) = \frac{\tan^{-1} x}{1 - x + x^2}$ 의 3차의 Maclaurin 다항식  $T_3$ 는?

- ①  $T_3(x) = x + x^2 - \frac{1}{3}x^3$       ②  $T_3(x) = x + x^2 + \frac{1}{3}x^3$       ③  $T_3(x) = x - x^2 - \frac{1}{3}x^3$   
 ④  $T_3(x) = 1 - x - \frac{1}{3}x^3$       ⑤  $T_3(x) = 1 - x^2 - \frac{1}{3}x^3$

35. [1.1점] 곡선  $y = \sqrt{\sin(\ln x)}$ ,  $1 \leq x \leq e^{\pi}$ 와  $x$ 축으로 둘러싸인 영역을  $x$ 축 둘레로 회전시켜 얻은 입체의 부피를 구하면?

- ①  $\pi$       ②  $\frac{\pi}{2}(e^{\pi} - 1)$       ③  $\pi(e^{\pi} - 1)$   
 ④  $\pi(1 + e^{\pi})$       ⑤  $\frac{\pi}{2}(1 + e^{\pi})$



36. [1.1점] 양수  $a$ 에 대하여, 곡선  $y = \frac{x}{(x^2+1)(x^2+4)(x^2+9)}$ ,  $x$ -축, 그리고 직선  $x=a$ 로 둘러싸인 영역을  $y$ -축 둘레로 회전하여 얻어진 입체의 부피를  $V(a)$ 라할 때,  $\lim_{a \rightarrow \infty} V(a)$ 의 값을 구하면?

- ①  $\frac{\pi}{120}$       ②  $\frac{\pi}{60}$       ③  $\frac{\pi^2}{60}$       ④  $\frac{\pi}{240}$       ⑤  $\frac{\pi^2}{240}$

37. [1.1점] 선적분  $\oint_C ((y^2+2y)dx + (2xy+4x)dy)$ 의 값을 구하라. 단, 곡선  $C$ 는 세 점  $A(-1,-1)$ ,  $B(2,-1)$ ,  $C(1,2)$ 을 꼭짓점으로 갖는 삼각형으로 이루어진 반시계 방향의 단순 폐곡선이다.

- ① 9      ② 3      ③ 0      ④ -3      ⑤ -9

38. [1.0점] 함수  $f: \mathbb{R} \rightarrow \mathbb{R}$ 는  $\lim_{x \rightarrow -\infty} f(x) = -\infty$ ,  $\lim_{x \rightarrow \infty} f(x) = \infty$ 를 만족하는 순증가 함수이다. 다음 <보기>의 내용 중 옳은 것은 모두 몇 개인가?

<보기>

- 가. 모든  $x$ 에 대하여  $f(f(x)) > f(x)$ 가 성립한다.  
 나.  $f$ 가 모든 점에서 연속이면 역함수가 존재한다.  
 다.  $f$ 가 모든 점에서 연속이면 역함수도 모든 점에서 연속이다.  
 라.  $f$ 가 모든 점에서 미분가능이면 역함수도 모든 점에서 미분가능이다.

- ① 0개      ② 1개      ③ 2개      ④ 3개      ⑤ 4개

39. [0.8점] 모든 양의 실수  $x$ 에 대하여 다음 부등식이 성립하는  $a$ 의 최솟값은?

$$3e^x - 3e^{-x} - 6x - x^3 > ax^5$$

- ① 1      ②  $\frac{1}{4}$       ③  $\frac{1}{5}$       ④  $\frac{1}{20}$       ⑤  $\frac{1}{100}$

40. [1.0점] 미분가능한 이변수 함수  $f(x,y)$ 가 아래 표에 나타난 값을 가진다.

$(a,b)$	$(-1,-1)$	$(-1,1)$	$(1,-1)$	$(1,1)$
$f(a,b)$	0.2	-0.4	0.5	0.3
$\frac{\partial f}{\partial x}(a,b)$	0.5	0.2	1.5	-1.2
$\frac{\partial f}{\partial y}(a,b)$	2.5	0.5	-2.5	0.5

함수  $g(x,y) = \sqrt{3x^2 + 2y^2 - 8f(x,y)}$ 의  $(1,-1)$ 에서의 일차근사함수를 이용하여  $g(1.2, -1.01)$ 의 근삿값을 구하면?

- ① 0.3      ② 0.32      ③ 0.34      ④ 0.36      ⑤ 0.38

41. [1.1점] 곡선  $C: \begin{cases} x = 2 \cos t \\ y = 3 \sin t \end{cases} (0 \leq t \leq 2\pi)$ 에 대하여 선적분  $\frac{1}{2} \int_C \left( -\frac{x}{x^2 + y^2} dy + \frac{y}{x^2 + y^2} dx \right)$ 의 값을 구하면

- ①  $-\pi$       ②  $-1$       ③  $0$       ④  $1$       ⑤  $\pi$

42. [1.1점] 극좌표 곡선  $r = 1 + 2\cos\theta$ 의  $\theta = \frac{\pi}{3}$ 에 대응하는 점에서 곡선에 그은 접선을  $\ell$ 이라할 때 직선  $\ell$ 이  $x$ 축과 만나는 점의 직교 좌표는?

- ①  $(-8,0)$       ②  $(-4,0)$       ③  $(0,0)$       ④  $(4,0)$       ⑤  $(8,0)$

43. [1.0점]  $x^2 + y^2 \leq 1$ 에서  $x^2 + 2xy - y^2$ 의 최댓값은 얼마인가?

- ①  $\frac{1}{\sqrt{2}}$       ②  $\frac{1}{2}$       ③  $1$       ④  $\sqrt{2}$       ⑤  $2$

44. [1.0점] 곡면  $S_1: x^2 - y^2 + 2z^2 = -1$ 과 곡면  $S_2: x^2 + y^2 + z^2 = 6$ 의 교점  $(1,2,-1)$ 에서 두 곡면에 그은 접평면의 교선의 방정식은  $x = 1 + \alpha t$ ,  $y = 2 + \beta t$ ,  $z = -1 - 2t$ 이다.  $\alpha + \beta$ 의 값은?

- ①  $-4$       ②  $-\frac{7}{2}$       ③  $-\frac{5}{2}$       ④  $5$       ⑤  $7$

45. [1.1점] 다음 <보기>의 내용 중 옳은 것은 모두 몇 개인가?

<보기>

가. 무한급수  $\sum_{n=1}^{\infty} a_n$ 이 조건부 수렴하면(conditionally convergent) 무한급수

$\sum_{n=1}^{\infty} n^2 a_n$ 은 발산한다.

나. 무한급수  $\sum_{n=1}^{\infty} a_n$ 이 수렴하면 무한급수  $\sum_{n=1}^{\infty} (-1)^n a_n$ 은 수렴한다.

다.  $\sum_{n=3}^{\infty} \frac{1}{n(\ln n)^2} < \frac{1}{\ln 2}$

라. 멱급수  $\sum_{n=1}^{\infty} a_n x^n$ 의 수렴반경이 1이면  $\sum_{n=1}^{\infty} a_n$ 은 수렴한다.

- ① 0개      ② 1개      ③ 2개      ④ 3개      ⑤ 4개

46. [1.0점] 실수 전체에서 아래와 같이 정의된 함수  $f$ 를 생각하자.

$$f(x) = \begin{cases} e^{-\frac{1}{x^2}}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

함수  $f$ 에 대한 <보기>의 내용 중 옳은 것은 모두 몇 개인가?

<보기>

가.  $\lim_{x \rightarrow 0} f(x) = 0$

나.  $f$ 는 최솟값 0과 최댓값 1을 가진다.

다.  $f$ 는 실수 전체에서 미분가능이다.

라.  $f''(0)$ 은 존재하지 않는다.

- ① 0개      ② 1개      ③ 2개      ④ 3개      ⑤ 4개

47. [1.0점]  $\int_{-\frac{1}{\sqrt{2}}}^0 \left( \int_{-x}^{\sqrt{1-x^2}} y dy \right) dx + \int_0^{\frac{1}{2}} \left( \int_0^{\sqrt{3}y} y dx \right) dy + \int_{\frac{1}{2}}^1 \left( \int_0^{\sqrt{1-y^2}} y dx \right) dy$ 의 값은?
- ①  $\frac{1}{6} \left( \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \right)$       ②  $\frac{1}{6} \left( \frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2} \right)$       ③  $\frac{1}{3} \left( \frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2} \right)$
- ④  $\frac{1}{3} \left( \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \right)$       ⑤  $\frac{1}{2}$

※ (문제 48-50) 다음 글을 읽고 물음에 답하라.

이상 적분  $I = \int_0^\infty e^{-x^2} e^{-4x^{-2}} dx$ 의 값을 구하는 요령을 살펴보자. 우선 다음과 같이 변형한다:

$$I = \int_0^\infty e^{-x^2} e^{-4x^{-2}} dx = e^{-\alpha} \int_0^\infty e^{-(x + \beta x^{-1})^2} dx.$$

여기서  $x = \gamma t^{-1}$ 라 치환하여 아래 식을 얻는다:

$$I = e^{-\alpha} \int_0^\infty e^{-(t + \beta t^{-1})^2} \gamma t^{-2} dt.$$

이로부터

$$2I = e^{-\alpha} \int_0^\infty e^{-(x + \beta x^{-1})^2} (1 + \gamma x^{-2}) dx.$$

마지막으로  $u = x + \beta x^{-1}$ 로 치환하면, 아래 식을 얻는다:

$$2I = e^{-\alpha} \int_\mu^\infty e^{-u^2} du.$$

잘 알려진  $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$ 을 활용하여  $I$ 의 값을 구할 수 있다.

48. [1.0점]  $\alpha + \beta$ 의 값으로 적절한 것은?

① -4      ② -2      ③ 0      ④ 2      ⑤ 4

49. [1.0점]  $\lim_{x \rightarrow \mu} (1 + \gamma x^{-1})^{|x|}$ 를 구하면?

①  $e^{-4}$       ②  $e^{-2}$       ③ 1      ④  $e^2$       ⑤  $e^4$

50. [1.1점]  $\int_0^\infty e^{-x^2} e^{-4x^{-2}} dx$ 의 값은?

①  $\frac{\sqrt{\pi}}{2} e^{-4}$       ②  $\frac{\sqrt{\pi}}{4} e^{-4}$       ③ 1      ④  $\frac{\sqrt{\pi}}{4} e^4$       ⑤  $\frac{\sqrt{\pi}}{2} e^4$