

**2019학년도
아주대학교 편입학 수강능력시험**

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

1. (0.8 points) Automated scientific work flows can _____ raw data from various field sensors and perform a series of computations that are executed sequentially.

- ① incline
- ② compile
- ③ evacuate
- ④ discharge
- ⑤ legitimize

2. (0.8 points) Pharmaceutical analytics units must collaborate with multiple stakeholders to increase their accountability for quality use of medicines, and to _____ in medical disputes.

- ① evolve
- ② consult
- ③ concoct
- ④ legislate
- ⑤ intervene

Questions 3-5: Choose the expression that best completes the sentence.

3. (1.0 points) Masculinity has tended to be _____ as femininity in the modern world.

- ① as a construct fissured and complex
- ② as a fissured and complex construct
- ③ as fissured and complex construct
- ④ as fissured and complex a construct
- ⑤ as fissured and as complex construct

4. (0.8 points) The frequent usage of “the frontier” in the American political program is linked to the image of the American economy as an endlessly fertile continent _____ would never be reached.

- ① whose boundaries
- ② its boundaries
- ③ which boundaries
- ④ for which boundaries
- ⑤ boundaries of which

5. (1.1 points) It is a truth universally acknowledged that a single man in possession of a good fortune, must be in want of a wife. _____ the feelings or views of such a man may be, this truth is so well fixed in the minds of the surrounding families that he is considered as the rightful property of some, one, or other of their daughters.

- ① However better known
- ② However little is known about
- ③ How little it is known
- ④ How few known
- ⑤ How it is known that

Questions 6-7: Choose the underlined word or phrase that must be changed for the sentence to be correct.

6. (1.0 points) It was ironic that the yuppies came to be so reviled ①for their vaunting ambition and outsized expectations, as if they ②invented the habit of more, when in fact they' d only inherited it ③the way a fetus picks up an addiction ④in the womb. The craving was there in the national bloodstream, and the baby boomers found themselves in the melancholy position of wrestling with a two-hundred-year dependency on a drug that was now ⑤in short supply.

7. (0.8 points) ①Despite of the growth of international organizations ②concerned with refugees and human rights, sovereign nations still fiercely guard their absolute right to determine ③who can or cannot be accepted as refugees; ④all sorts of subterfuges are used to keep out refugees. The only solution to the current crisis has been the creation of ever ⑤more and larger refugee camps.

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) The transportation revolution and the market revolution would have come much more slowly if the Americans of the early republic had followed the *laissez-faire* (non-interference) notions of political economy that are often mistakenly ascribed to them. Instead, the people demanded that their governments ally themselves with private enterprise to speed the march of progress.

- (a) The most notable alliance of public and private enterprise was in the field of politics.
- (b) The Americans of the early republic are frequently misunderstood to have followed the policy of *laissez-faire*.
- (c) The people of the early republic asked their governments to work with private businesses.
- (d) Because the Americans of the early republic did not adopt the non-interference policy, the transportation and market revolutions were achieved more rapidly.

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

9. (1.1 points) Kids started having their own cameras, *en masse*, in the 1960s, Kodak Instamatics, which came out in 1963, were inexpensive and easy to use, durable and small, the perfect size in a child's pocket or the upper tray of a footlocker on its way to summer camp. The Instagram logo, in a conscious nod, echoes the look of the early Instamatics.

- (a) The sales of kid products is price-sensitive.
- (b) Before the 1960s, kids were not allowed to use cameras.
- (c) Kodak Instamatics renovated and popularized the camera.
- (d) The Instagram logo inadvertently imitated the design of the Instamatics.

- ① (a) & (b)
- ② (b) & (c)
- ③ (a) & (c)
- ④ (a), (c) & (d)
- 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] The textbook genre, irrespective of the discipline it is associated with, serves a common purpose in academic contexts, which is reflected in a number of typical features of textbook genres. Textbooks disseminate discipline-based knowledge and, at the same time, display a somewhat unequal writer-reader relationship, with the writer as the specialist and the reader as the non-initiated novice in the discipline. However, this effort to disseminate introductory uncontested knowledge is sometimes compromised by an attempt to offer what is claimed to be the ‘cutting edge’ theories. Textbooks nevertheless are seen as ‘repositories of codified knowledge’ made accessible to large audiences by the frequent use of a variety of rhetorical devices such as reporting, questioning, advance labelling and enumeration.

[B] However, (a) _____, disciplinary cultures differ on several dimensions, some of which include constraints on patterns of membership, variation in knowledge structure and norms of inquiry, typical patterns of rhetorical intimacy associated with typical modes of expressions, specialist lexis and discourses, and distinct approaches to the teaching of these disciplines.

[C] Let me begin with two disciplines, i.e. those of economics and law, in an attempt to compare the way disciplinary knowledge is structured and communicated in instructional contexts. On the face of it, the two disciplines appear to be similar in that both of them tend to reinforce the relationship between rhetorical aspects, processes, and outcomes. Similarly, they may also create and formulate a complexity of integrated concepts and use grammatical metaphors to pack disciplinary knowledge for their specific audiences. They may also share the way they need to explain the interrelationship between various concepts by referring to facts and figures, though it is likely that in business such facts and figures have numerical values, whereas in law they consist of human acts entangled in socio-legal relations.

[D] In a number of other ways, the two disciplines appear to be very different, especially in terms of the rhetorical strategies they employ to construct knowledge. Business studies, in general, depends on aggressive innovation in the way it constructs its discourses. In fact, much of innovation in communicative practices in many other professional contexts, in the last few decades, has been inspired by changes in communicative patterns in the field of business, which is also reflected in economics textbooks. Law, on the other hand, relies on extreme conservatism in the way it constructs its discourses. This has also influenced other forms of expressions in the field. Textbook writing in law is no exception in this respect.

10. (1.0 points) Which of the following best fits in the blank (a) in paragraph [B]?
- ① in spite of these shared characteristics of textbooks across disciplines
 - ② regardless of definitions and clarifications of technical concepts
 - ③ with reference to a number of common disciplinary variations
 - ④ by means of similar discursive practices in different disciplines
 - ⑤ apart from the universal relationship between genres and specialist disciplines
11. (1.0 points) According to the passage, which of the following is NOT mentioned as the characteristics of textbook genres?
- ① They offer state-of-the-art information.
 - ② They involve discipline-specific knowledge.
 - ③ They employ a range of rhetorical strategies.
 - ④ They display a hierarchical author-reader relationship.
 - ⑤ They contain information targeted to a limited group of readers.
12. (1.0 points) According to the passage, which of the following is NOT a common feature of economics and law?
- ① Complicatedly integrated concepts may be constructed.
 - ② Numerical values of facts and figures can be emphasized.
 - ③ Metaphors can be utilized to convey discipline-based information.
 - ④ Facts and figures may be employed to illustrate the association of concepts.
 - ⑤ The relationship between rhetorical aspects, processes and outcomes can be consolidated.
13. (1.1 points) According to the passage, the two key expressions “aggressive innovation” and “extreme conservatism” are mentioned because _____
- ① textbooks are developed according to these two goals.
 - ② these two have influenced the way legal textbooks are written.
 - ③ these two are the pivotal ways disciplinary knowledge is delivered.
 - ④ they are the properties characteristic of business and law, respectively.
 - ⑤ textbooks have changed their focused attention from conservatism to innovation.

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

[A] The object called the Möbius strip has fascinated environmentalists, artists, engineers, mathematicians and many others ever since its discovery in 1858 by August Möbius, a German mathematician. Möbius seems to have encountered the Möbius strip while working on the geometric theory of polyhedra, solid figures composed of vertices, edges, and flat faces. ❶ A Möbius strip can be created by taking a strip of paper, giving it an odd number of half-twists, then taping the ends back together to form a loop. If you take a pencil and draw a line along the center of the strip, you'll see that the line runs along both sides of the loop.

[B] The concept of a one-sided object inspired artists like Dutch graphic designer M.C. Escher, whose woodcut "Möbius Strip II" shows red ants crawling one after another along a Möbius strip. ❷ The Möbius strip has more than just one surprising property. For instance, try taking a pair of scissors and cutting the strip in half along the line you just drew. You may be astonished to find that you are left not with two smaller one-sided Möbius strips, but instead with one long two-sided loop.

[C] ❸ A topologist studies properties of objects that are preserved when moved, bent, stretched or twisted, without cutting or gluing parts together. For example, a tangled pair of earbuds is in a topological sense the same as an untangled pair of earbuds, because changing one into the other requires only moving, bending and twisting. Another pair of objects that are topologically the same are a coffee cup and a doughnut. ❹ Because both objects have just one hole, one can be (a)_____ into the other through just stretching and bending. The number of holes in an object is a property which can be changed only through cutting or gluing. This property - called the "genus" of an object - allows us to say that a pair of earbuds and a doughnut are topologically different, since a doughnut has one hole, whereas a pair of earbuds has no holes.

[D] Unfortunately, a Möbius strip and a two-sided loop, like a typical silicone awareness wristband, both seem to have one hole, so this property is insufficient to tell them apart - at least from a topologist's point of view. Instead, the property that distinguishes a Möbius strip from a two-sided loop is called (b) orientability. Like its number of holes, an object's orientability can only be changed through cutting or gluing. ❺ Imagine writing yourself a note on a see-through surface, then taking a walk around on that surface. The surface is orientable if, when you come back from your walk, you can always read the note. On a nonorientable surface, you may come back from your walk only to find that the words you wrote have apparently turned into their mirror image and can be read only from right to left. On the two-sided loop, the note will always read the same, no matter where your journey took you. Since the Möbius strip is nonorientable, whereas the two-sided loop is orientable, the Möbius strip and the two-sided loop are topologically different

14. (1.1 points) Which of the following is the best title of the above passage?

- ① The Mathematical Implication of Möbius Strips and Other One-Sided Objects
- ② The Critical Differences between One-Sided Objects and Two-Sided Objects
- ③ The Academic Usability of Möbius Strips
- ④ The Unexpected Effects of the Discovery of Möbius Strips
- ⑤ The Distinguishing Characteristics of Möbius Strips and Other One-Sided Objects

15. (0.8 points) Which of the following can best fill in the blank (a) in paragraph [C]?

- ① deformed
- ② conformed
- ③ performed
- ④ preformed
- ⑤ thermoformed

16. (1.1 points) Which of the following is NOT true about (b) orientability in paragraph [D]?

- ① A two-sided loop is orientable.
- ② It can be a “genus” of a group of objects.
- ③ Twisting an object can affect its orientability.
- ④ It has mainly been investigated in the field of topology.
- ⑤ It can distinguish a silicon awareness bracelet from a Möbius strip.

17. (1.0 points) The following paragraph is removed from the passage. In which part may it be inserted to support the argument made by the author?

While the strip certainly has visual appeal, its greatest impact has been in mathematics, where it helped to spur on the development of an entire field called topology.

- ① ①
- ② ②
- ③ ③
- ④ ④
- ⑤ ⑤

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

[A] Mammals and birds regularly express mate preferences and make mate choices. Data on mate choice among mammals suggest that this behavioral ‘attraction system’ is associated with dopaminergic reward pathways in the brain. It has been proposed that intense romantic love, a human cross-cultural universal, is a developed form of this attraction system.

[B] To begin to determine the neural mechanisms associated with romantic attraction in humans, we used functional magnetic resonance imaging (fMRI) to study 17 people who were intensely ‘in love.’ Activation specific to the beloved occurred in the brainstem right ventral tegmental area and right postero-dorsal body of the caudate nucleus. These and other results suggest that dopaminergic reward and motivation pathways contribute to aspects of romantic love.

[C] We also used fMRI to study 15 men and women who had just been rejected in love. Preliminary analysis showed activity specific to the beloved in related regions of the reward system associated with monetary gambling for uncertain large gains and losses, and in regions of the lateral orbito frontal cortex associated with theory of mind, obsessive/compulsive behaviors and controlling anger, revealed in recently abstinent cocaine-dependent individuals.

[D] These data contribute to our view that romantic love is one of the three primary brain systems that evolved in avian and mammalian species to direct reproduction. The sex drive evolved to motivate individuals to seek a range of mating partners; attraction evolved to motivate individuals to prefer and pursue specific partners; and attachment evolved to motivate individuals to remain together long enough to complete species-specific parenting duties. These three behavioral repertoires appear to be based on brain systems that are largely distinct yet interrelated, and they interact in specific ways to orchestrate reproduction, using both hormones and monoamines. Romantic attraction in humans and its antecedent in other mammalian species play a primary role: this neural mechanism motivates individuals to focus their courtship energy on specific others, thereby conserving valuable time and metabolic energy, and (a) _____.

18. (1.1 points) Which of the following would be the best title for the above passage?

- ① Romantic Love: Absolute Human Faculty
- ② Romantic Love: A Mammalian Brain System for Mate Choice
- ③ No Romantic Love: What the Brain Lies about in Mate Choices
- ④ No Romantic Love: Another Word for Sex Drive
- ⑤ Human Brain Demystified

19. (1.1 points) According to the above passage, which of the following is NOT true?

- ① When mammals choose their mates, it is likely that dopamine is released in their brains.
- ② fMRI helps us to measure and map brain activity.
- ③ The brains of those rejected in love show patterns similar to those of drug-addicts.
- ④ Romantic love is related to mammals' brains that control reproduction.
- ⑤ The word "attachment" connotes more durability than the word "attraction."

20. (1.0 points) Which of the following would best fit in the blank (a) in the paragraph [D]?

- ① helping them to focus on more important things in life.
- ② interfering with mate choice.
- ③ preventing them from focusing on more important things in life.
- ④ facilitating mate choice.
- ⑤ helping them to fall in love.

21. (1.0 points) According to the passage, the author suggests that some animals stay with their mates for a long time mainly to _____.

- ① feel dopamine-induced happiness.
- ② consummate their relationship in a more stable way.
- ③ cooperate to raise their children.
- ④ protect themselves against hostile environment.
- ⑤ experience marital bliss.

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

[A] In the global resource wars, the environmentalism of the poor is frequently triggered when an official landscape is forcibly imposed on a vernacular one. A vernacular landscape is shaped by the affective, historically textured maps that communities have devised over generations, maps (1) replete with names and routes, maps alive to significant ecological and surface geological features. A vernacular landscape, although neither monolithic nor undisputed, is integral to the socio-environmental dynamics of community rather than being wholly externalized — treated as out there, as a separate nonrenewable resource.

[B] By contrast, an official landscape — whether government, NGO, corporate or some combination of those — is typically (2) oblivious to such earlier maps; instead, it writes the land in a bureaucratic, externalizing, and extraction-driven manner that is often pitilessly instrumental. Lawrence Summers' scheme to export rich nation garbage and toxicity to Africa, for example, stands as a grandiose (though hardly exceptional) instance of a highly rationalized official landscape that, whether in terms of elite capture of resources and toxic disposal, has often been projected onto ecosystems inhabited by those “disposable citizens.”

[C] The (3) exponential upsurge in indigenous resource rebellion across the globe has resulted largely from a clash of temporal perspectives between the short-termers who arrive with their (a) _____ landscape maps to extract, despoil, and depart and the long-termers who must live inside the ecological (4) aftermath and must therefore weigh wealth differently in time' s scale. More than material wealth is here at stake: imposed (b) _____ landscapers typically discount spiritualized (c) _____ landscape, severing webs of accumulated cultural meaning and treating the landscape as if it were (5) uninhabited by the living, the unborn, and the animate deceased.

22. (1.1 points) Which of the following is the best title of the above passage?

- ① The Best Way to Utilize Natural Resources
- ② The Contrast between an Official and a Vernacular Landscape
- ③ The Advantages and Disadvantages of Landscaping Technology
- ④ The Environmentalism of the Poor and Its Resistance
- ⑤ The Survival of the Poor in the Global Age

23. (1.0 points) Which of the following can best fill in the blanks (a), (b) and (c) in the paragraph [C]?

- | | | |
|------------------|----------------|----------------|
| ① (a) official | (b) official | (c) vernacular |
| ② (a) vernacular | (b) official | (c) vernacular |
| ③ (a) vernacular | (b) vernacular | (c) official |
| ④ (a) official | (b) vernacular | (c) official |
| ⑤ (a) official | (b) official | (c) official |

24. (1.1 points) Which of the following CANNOT be inferred from the above?

- ① If we treat an ecosystem as disposable, it amounts to treating people as disposable.
- ② Some developers do not calculate the long-term consequences of a destroyed ecosystem.
- ③ There is intensified resistance against the intensified assaults on resources in this global age.
- ④ A vernacular landscape reflects indigenous people's unchanging agreement on their landscape.
- ⑤ The idea of offloading rich-nation toxins onto the world's poorest continent is not rarely proposed.

25. (1.0 points) Which of the following pairs includes a word that CANNOT replace the underlined word in the passage?

- ① (1) replete, filled
- ② (2) oblivious, blind
- ③ (3) exponential, rapid
- ④ (4) aftermath, consequence
- ⑤ (5) uninhabited, prohibited

※ (문제 26-47) 다음 물음에 답하라.

26. [0.8점] $0 \leq x \leq 1$ 인 범위에서 $\cos(\sin^{-1}(-\sqrt{1-x}))$ 를 간단히 하면?

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

27. [0.8점] 실수 전체에서 정의된 함수 $f(x) = 2e^{x+1} - 2x - x^2$ 의 역함수를 g 라 할 때, $g'(3)$ 의 값은?

- ① 1 ② $\frac{1}{2}$ ③ $\frac{1}{3}$ ④ $\frac{1}{6}$ ⑤ $\frac{1}{7}$

28. [1.1점] f 는 실수 전체에서 정의된 미분가능한 함수이다. 함수 f 에 대한 다음 표의 값을 이용하여 $(f \circ f \circ f)'(0)$ 의 값을 구하면?

a	-2	-1	0	1	2	4
$f(a)$	4	0	1	-1	1	0
$f'(a)$	3	2	-3	1	4	2

- ① -8 ② -6 ③ -4 ④ 2 ⑤ 8

29. [0.8점] 곡선 $x^2 = y^3 - y + 3$ 위의 점 (3, 2)에서의 접선의 기울기는?

- ① $\frac{6}{11}$ ② $\frac{3}{11}$ ③ $\frac{1}{2}$ ④ $-\frac{1}{2}$ ⑤ $\frac{3}{2}$

30. [1.0점] 극한 $\lim_{x \rightarrow 0} \frac{x(\cos 2x - 1)}{\tan^{-1} x - x}$ 의 값은?

- ① -6 ② -2 ③ 0 ④ 2 ⑤ 6

31. [1.1점] 이변수 함수 $f(x, y) = \sqrt{x^2 + 3y^2}$ 에 대한 (1, 1)에서의 일차 근사 함수(linear approximation, tangent plane approximation)를 이용하여 $f(1.2, 0.9)$ 의 근삿값을 구하면?

- ① 1.95 ② 1.99 ③ 2.01 ④ 2.05 ⑤ 2.1

32. [1.1점] 무한급수 $\sum_{n=1}^{\infty} \frac{n^2+3n+1}{(n+2)!}$ 의 값을 구하면?

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

33. [1.0점] 무한급수 $\sum_{n=1}^{\infty} a_n$ 의 수렴 · 발산 판정에 대한 다음 설명 중 옳은 것은?

- ① 모든 n 에 대해 $a_n \leq b_n$ 이고 $\sum_{n=1}^{\infty} b_n$ 이 수렴하면 $\sum_{n=1}^{\infty} a_n$ 은 수렴한다.
 ② 모든 n 에 대해 $b_n \leq a_n$ 이고 $\sum_{n=1}^{\infty} b_n$ 이 수렴하면 $\sum_{n=1}^{\infty} a_n$ 은 수렴한다.
 ③ 모든 n 에 대해 $b_n \leq a_n$ 이고 $\sum_{n=1}^{\infty} b_n$ 이 발산하면 $\sum_{n=1}^{\infty} a_n$ 은 발산한다.
 ④ 모든 n 에 대해 $|b_n| \leq a_n$ 이고 $\sum_{n=1}^{\infty} b_n$ 이 수렴하면 $\sum_{n=1}^{\infty} a_n$ 은 수렴한다.
 ⑤ 모든 n 에 대해 $|b_n| \leq a_n$ 이고 $\sum_{n=1}^{\infty} b_n$ 이 발산하면 $\sum_{n=1}^{\infty} a_n$ 은 발산한다.

34. [1.0점] 다음 중 무한급수 $\sum_{n=1}^{\infty} \frac{(-1)^{nq}}{n^p (\ln(n+2019))^{q/2}}$ 가 발산하는 경우는?

- ① $p=3, q=1$ ② $p=2, q=2019$ ③ $p=1, q=1$
 ④ $p=1, q=2$ ⑤ $p=1, q=4$

35. [1.1점] $f(x) = \sum_{n=0}^{\infty} (n+1)x^{2n}$ 일 때 $\sum_{n=0}^{\infty} n^2 x^{2n}$ 으로 표현되는 함수는?

- ① $xf'(x) - x^2f(x)$ ② $\frac{x}{2}f'(x) - x^2f(x)$ ③ $xf'(x) - \frac{x^2}{2}f(x)$
 ④ $2xf'(x) - x^2f(x)$ ⑤ $2xf'(x) + x^2f(x)$

36. [0.8점] 평면상의 영역 $\{(x,y) : x^2+y^2 \leq 4, (x-1)^2+y^2 \geq 1\}$ 의 무게 중심의 좌표는 $(a, 0)$ 이다. 이때 a 의 값은?

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

37. [1.1점] 곡선 $y = \frac{1}{2}\left(x^2 - \frac{1}{2}\ln x\right)$, $1 \leq x \leq 2$ 의 길이는?

- ① $\frac{1}{2} + \frac{1}{2}\ln 2$ ② $1 + \frac{1}{2}\ln 2$ ③ $\frac{3}{2} + \frac{1}{2}\ln 2$
 ④ $\frac{3}{2} + \frac{1}{4}\ln 2$ ⑤ $\frac{3}{2} + \ln 2$

38. [1.0점] 이상 적분 $\int_{\frac{1}{2}}^{\infty} \frac{dx}{1+4x^2}$ 의 값은?

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

39. [1.0점] <보기>의 내용 중 옳은 것은 모두 몇 개인가?

<보기>

가. $\pi - \frac{\pi^3}{3!} + \frac{\pi^5}{5!} - \frac{\pi^7}{7!} + \dots$ 은 0으로 수렴한다.

나. $\int_0^4 \frac{2x}{x^2-1} dx = \ln 15$

다. 무한급수 $S = \sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n}$ 의 2019번째 부분합 S_{2019} 는 S 보다 크다.

라. $\sum_{n=1}^{\infty} (-1)^n \sin^3\left(\frac{1}{\sqrt{n}}\right)$ 은 절대 수렴한다(absolutely convergent).

- ① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

40. [1.1점] $y = 1 - |x|$ 와 x 축으로 둘러싸인 도형을 직선 $x = 2$ 주위로 회전하여 얻어진 회전체의 부피는?

- ① π ② 2π ③ 3π ④ 4π ⑤ 5π

41. [1.0점] 함수 $f(x) = x^5 - 4x^3 + 3x^2 - 2 + \sin^4(x-1)$ 에 대한 $x = 1$ 에서 2차의 테일러 다항식을 $P(x)$ 라 할 때, $P(2)$ 는?

- ① -4 ② -2 ③ 0
 ④ 2 ⑤ 4

42. [1.1점] 꼬인 위치의 두 직선 $x-1 = y+2 = z-3$ 과 $x = \frac{y+2}{2} = \frac{z-3}{3}$ 사이의 거리는?

- ① $\frac{1}{\sqrt{42}}$ ② $\frac{3}{\sqrt{42}}$ ③ $\frac{1}{\sqrt{6}}$ ④ $\frac{3}{\sqrt{6}}$ ⑤ $\frac{1}{\sqrt{21}}$

43. [1.0점] 미분가능한 이변수 함수 $f(u, v)$ 에 대하여 $w = g(x, y) = f(x+2y-1, 2x-y)$ 라 하자.

아래 표를 이용하여 $\left. \frac{\partial w}{\partial y} \right|_{x=1, y=1}$ 의 값을 구하면?

(u, v)	f	$\frac{\partial f}{\partial u}$	$\frac{\partial f}{\partial v}$
(1, 1)	1	1	2
(1, 2)	3	-2	1
(2, 1)	2	-1	-1
(2, 2)	1	2	2

- ① -2 ② -1 ③ 0 ④ 1 ⑤ 2

44. [1.0점] 곡선 $y = x^4$ 을 y 축 주위로 회전하여 얻어진 물탱크에 물을 넣고 있다. 물의 깊이가 4cm 일 때 수면의 높이가 2cm/sec 의 속도로 증가하고 있다면, 그때 수면의 넓이의 변화율은 몇 cm^2/sec 인가?

- ① 4π ② 2π ③ π ④ $\frac{3}{2}\pi$ ⑤ $\frac{\pi}{2}$

45. [1.1점] 점 (x, y) 가 $4x^2 + y^2 + xy = 1$ 을 만족할 때 e^{xy} 의 최댓값은?

- ① e ② $e^{1/3}$ ③ $e^{1/5}$ ④ 1 ⑤ 존재하지 않는다.

46. [1.1점] 다음 적분의 값은?

$$\int_0^1 \left[\int_{\sqrt{x}}^1 \sin(\pi y^3) dy \right] dx$$

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

47. [1.0점] 극좌표 방정식 $r = \sqrt{\sin^3 \theta}$, $0 \leq \theta \leq \pi$ 로 표현되는 곡선에 의해 둘러싸인 영역의 넓이는?

- ① $\frac{2}{3}$ ② $\frac{2}{3}\pi$ ③ $\frac{1}{3}$ ④ $\frac{1}{3}\pi$ ⑤ π

※ (문제 48-50) 다음 글을 읽고 물음에 답하라.

이상 적분 $I = \int_0^{\infty} x^2 e^{-x^2} dx$ 의 값을 구하기 위하여 다음 과정을 생각해 보자.

$$\begin{aligned} I^2 &= \left(\int_0^{\infty} x^2 e^{-x^2} dx \right) \left(\int_0^{\infty} y^2 e^{-y^2} dy \right) \\ &= \int_0^{\infty} \left(\int_0^{\infty} x^2 y^2 e^{-x^2-y^2} dy \right) dx \end{aligned}$$

마지막 반복 적분을 극좌표로 변환하면,

$$\begin{aligned} I^2 &= \int_0^a \left(\int_0^{\infty} r^m e^{-r^2} dr \right) \sin^2 \theta \cos^2 \theta d\theta \\ &= b \int_0^a \sin^2 \theta \cos^2 \theta d\theta \end{aligned}$$

한편 삼각함수의 배각 공식과 반각 공식에 의하여 $\sin^2 \theta \cos^2 \theta = \alpha + \beta \cos \gamma \theta$ 이므로

$$\int_0^a \sin^2 \theta \cos^2 \theta d\theta = \int_0^a (\alpha + \beta \cos \gamma \theta) d\theta = c.$$

이로부터 I^2 을 구하여 I 를 정할 수 있다.

48. [0.8점] a 의 값을 구하면?

- ① $\frac{\pi}{4}$ ② $\frac{\pi}{3}$ ③ $\frac{\pi}{2}$
 ④ π ⑤ 2π

49. [1.0점] c 의 값을 구하면?

- ① $\frac{\pi}{16}$ ② $\frac{\pi}{4}$ ③ 1
 ④ $\frac{\pi^2}{4}$ ⑤ $\frac{\pi^2}{16}$

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

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