2024학년도
아주대학교 편입학 수강능력시험

자연계열

성　　　명	
전　　　형	
수험번호	

Questions 1-3: Choose the word that best completes the sentence.

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1. (0.8 points) I am a man who has been filled with a profound conviction that the easiest way of life is the best. Hence, though I belong to a profession proverbially energetic and nervous, even to turbulence, at times, yet nothing of that sort have I ever suffered to invade my peace. I am one of those unambitious lawyers who never addresses a(n) _____, or in any way draws down public applause; but in the cool tranquility of a snug retreat, do a snug business among rich men's bonds and mortgages and title-deeds.

① ailment
② betrayal
③ coalition
④ jury
⑤ speech

2. (0.8 points) Since 2012, The World Happiness Report has ranked the average life satisfaction of more than 150 nations. In the past four years, the top slot has been taken by one country: Finland. Surprising is the fact that as the country has ascended to the top of the well-being charts, its economic development has remained remarkably flat. This seeming _____ confirms what many people have long suspected— that our traditional focus on economic growth doesn't translate into greater well-being.

① ambiguity
② contradiction
③ discord
④ proposition
⑤ revelation

3. (0.8 points) Scientists have created _____ human embryos using stem cells in a groundbreaking advance that sidesteps the need for eggs or sperm. Scientists say these model embryos, which resemble those in the earliest stages of human development, could provide a crucial window on the impact of genetic disorders and the biological causes of recurrent miscarriages. However, the work also raises serious ethical and legal issues as the lab-grown entities fall outside current legislation in the UK and most other countries.

① benign
② ingenuine
③ synthetic
④ tedious
⑤ vertical

Questions 4-5: Choose the expression that best completes the sentence.

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4. (1.0 points) Increasingly many New Yorkers tune out the city by tuning in to iPods and cellphones, adding an extra layer of personal sound to the public sound of the city. Yet through it all, the democratic ear takes it all in－ there is no neat flap of skin like the eyelid to turn the sound on or off. Never _____ as a New York eardrum.

① was overworked an organ so there
② was an organ overworked there
③ was there so overworked organ
④ was there so overworked an organ
⑤ there was so an organ overworked

5. (0.8 points) Suppose the former employer informs you of instances of misconduct which could prompt you to reject the individual for employment. _____ the applicant based on this bad reference, the previous employer may be liable for the tort of intentional interference with employment contract.

① Should refuse you to hire
② You should refuse hiring
③ You should refuse to hire
④ Should refuse you hiring
⑤ Should you refuse to hire

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

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6. (1.0 points) In Wesley Medical Center, and in most hospitals today, the people ① monitoring patients' heart rhythms, blood pressure, or respiratory functions are not nurses ② who interact with them. They are "telemetry" technicians who are supposed to ③alert those nurses to meaningful changes in the vital signs transmitted by electronic devices ④ hooking up to the patients. The technicians in telemetry units typically watch screens showing heart rhythms and numbers for many patients at a time－ sometimes dozens－ and often sit in a room ⑤far from the patients they are watching.

7. (1.0 points) In these early days, many have been content playfully ①<u>exploring</u> AI's possibilities. However, as these AI tools begin to unlock rapid advancements across all sectors of our society, more ②<u>fine-grained</u> control over who governs these foundational technologies will become increasingly important. In 2024, we will likely ③<u>to see</u> future-focused leaders ④<u>incentivizing</u> the development of their sovereign capabilities through ⑤ <u>increased</u> research and development funding, training programs, and other investments.

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

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8. (1.1 points) The old-line Wall Street law firms had a very specific idea about what it was that they did. They were corporate lawyers. They represented the country's largest and most prestigious companies, and "represented" meant they handled the taxes and the legal work behind the issuing of stocks and bonds and made sure their clients did not run afoul of federal regulations. They did not do litigations; that is, very few of them had a division dedicated to defending and filing lawsuits. As Paul Cravath, one of the founders of Cravath, Swaine, and Moore, the very whitest of the white-shoe firms, once put it, the lawyer's job was to settle disputes in the conference rooms, not in the courtroom.

(a) Old-line Wall Street law firms specialized in corporate law, managing taxes, and overseeing stock and bond issuances for major companies.

(b) Old-line Wall Street law firms rarely handled litigation, lacking dedicated divisions for lawsuits.

(c) Corporate lawyers in Wall Street firms focused on ensuring regulatory compliance, with emphasis on litigation.

(d) Paul Cravath asked lawyers at prestigious firms to aim to resolve disputes in conference rooms, not in courtrooms.

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① (a) & (b)

② (a) & (c)

③ (c) & (d)

④ (a), (c) & (d)

⑤ (a), (b), (c) & (d)

9. (1.1 points) It's one of the great paradoxes of evolution. Humans have demonstrated that having large brains is key to our evolutionary success, and yet, such brains are extremely rare in other animals. Most get by on tiny brains, and don't seem to miss the extra brain cells (neurons). Why? The answer that most biologists have settled on is that large brains are costly in terms of the energy they require to run. And, given the way natural selection works, the benefits simply don't exceed the costs.

> (a) Not all species require large brains to thrive.
>
> (b) Larger brains cause higher cognitive abilities or survival benefits.
>
> (c) While large brains have been evolutionarily advantageous for humans, they might not confer the same benefits across all species or environmental contexts.
>
> (d) If the energy expended on maintaining a larger brain doesn't significantly increase an organism's chances of survival and reproduction, it might not be favored by natural selection.

① (a) & (b)

② (b) & (c)

③ (b) & (d)

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] Most established companies focus on incremental innovation, entering new markets by tweaking products for new customers, using variations on a core product to stay on stop of the market, and creating interim solutions for industry-wide problems. When Scott Paper **(a) couldn't compete with** Fort Howard Paper Co. on price for the lucrative institutional toilet tissue market, it borrowed a solution from European companies: a dispenser that held bigger rolls. Scott made the larger rolls of paper and provided institutional customers with free dispensers, **(b) later did the same thing** with paper towels. ❶ Scott not only won over customers in a new market: it became less vulnerable to competitors, such as Fort Howard, which could lower prices but weren't offering the larger rolls or tailor-made dispensers.

[B] Newer companies create disruptive technologies that were cheaper and more likely to alter the competitive space. ❷ Established companies can be slow to react or invest in these disruptive technologies because they threaten their investment. Then they suddenly find **(c) themselves facing formidable new competitors**, and many fail. To avoid this trap, incumbent firms must carefully monitor the preference of both customers and non-customers and uncover evolving, difficult-to-articulate customer needs.

[C] What else can a company do? In a study of industrial products, a new-product specialist named Cooper found that the number one success factor is a unique, superior product. Such products succeed 98 percent of the time, **(d) compared to** products with a moderate advantage (58 percent success) or minimal advantage (18 percent success). Another key factor is a well-defined product concept. ❸ Other success factors are technological and marketing synergy, quality of execution in all stages, and market attractiveness.

[D] Cooper also found that products designed solely for domestic markets tend to show a high failure rate, low market share, and low growth. ❹ Those designed for the world market achieve significantly more profits at home and abroad. Yet only 17 percent of the products in his study were designed with an international orientation. ❺ The implication is that companies should consider adopting an international perspective in designing and developing new products, **(e) even if only to sell** in their home market.

10. (1.0 points) Which of the following would be the best title for the above passage?

① Critical Success Factors in Industrial Product Development
② The Dangers of Disruptive Technologies for New Companies
③ Strategies to Overcome Global Market Challenges
④ The Importance of a Domestic Perspective in Product Design
⑤ The Impact of Social Media on New Product Development

11. (1.1 points) The following sentence is removed from the above passage. In which part may it be inserted to support the argument made by the author?

> The company carefully defines and assesses the target market, product requirements, and benefits before proceeding.

① ❶　　　　② ❷　　　　③ ❸　　　　④ ❹　　　　⑤ ❺

12. (0.8 points) Choose the underlined word or phrase that must be changed for the sentence to be correct.

① (a) couldn't compete with
② (b) later did the same thing
③ (c) themselves facing formidable new competitors
④ (d) compared to
⑤ (e) even if only to sell

13. (1.1 points) According to the above passage, which of the following is NOT true?

① Newer companies need to attentively observe the preferences of both existing customers and potential customers to combat novel competitors.
② Key factors contributing to success include the excellence of a product and a well-defined product concept.
③ Scott provided institutional customers with a free dispenser for larger rolls of paper towels.
④ Established companies typically prioritize incremental innovation, approaching new markets by adjusting products for new customers.
⑤ Only 17 percent of the products in Cooper's study were designed with an international perspective.

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

[A] The spread of false narratives around three recent extreme weather events in Latin America shows how climate change misinformation in Spanish and Portuguese can **(a) undermine** efforts to address and mitigate the effects of global warming in the region, according to a new study. Environmental organizations Roots and Friends of the Earth, which are part of the Climate Action Against Disinformation Coalition, **(b) commissioned** the progressive research firm Purpose to analyze how cyclone floods in Brazil and Peru as well as wildfires in Chile became **(c) fertile** grounds for misinformation to flourish online.

[B] Online posts in Brazil, Peru, and Chile falsely attributed the events to dam breakages, arson, and climate research centers that study the atmosphere, sowing confusion, **(d) deflecting** conversations about extreme weather preparedness, and politicizing climate action, the study concluded. The new research points to "a troubling cycle," Max MacBride, counter-disinformation lead at Roots, said in a statement. A cyclone **(e) battered** the state of Rio Grande do Sul in southern Brazil in September. The storm's unusually heavy rains and wind gusts caused intense flooding and landslides that killed more than 30 people and severely damaged countless homes. While news sources online reported on the flooding in the context of a climate catastrophe, **(1)** _____.

[C] The false narrative began circulating a couple of days after the storm as center-right local leadership in the region publicly inquired about the "opening of the gates" to the company operating the dams, as stated in a media release, according to the study. The company responded, saying there was no evidence suggesting the dams had influenced the flooding. The Brazilian state's environmental department then confirmed the floods were caused by the cyclone and had no connection to the dams, but the false narrative kept spreading online.

[D] The study examined 66,800 posts, including posts on the social media site X and news portal comments about the floods and cyclone. A small number of them (1,800 posts) were found to also discuss the dam gates. But this small portion reached a significantly larger audience of over 5.2 million people, suggesting how social media algorithms can boost misinformation. "We won't be able to protect people in Latin America from climate change if professional disinformers keep manipulating weather disasters by gaming social media algorithms," Michael Khoo, the climate disinformation program director at Friends of the Earth, said in a statement.

14. (1.0 points) Which of the following would be the best title for the above passage?

① False Narratives are Under the Radar of the Platform's Content Moderation Policies
② False Narratives About Renewable Energy are Adapted to Different Languages
③ Arson is Blamed as the Single Cause of Forest Fires
④ A Few Conspiracy Theory Posts Have Little Reach Online
⑤ Climate Change Misinformation in Latin America Threatens Efforts to Combat It

15. (1.1 points) According to the above passage, which of the following is true?

① Roots and Friends of the Earth analyzed false narratives about cyclone floods in Brazil and Peru, and wildfires in Chile.
② The study reveals that misinformation had little impact on efforts to address global warming in Latin America.
③ The study examined 66,800 posts, most of which contained misinformation regarding dam gates.
④ Aligning with authorities confirming natural causes, false narratives about a cyclone in southern Brazil persisted online.
⑤ False narratives in Brazil, Peru, and Chile falsely attributed extreme weather events to dam breakages, arson, and climate research centers.

16. (0.8 points) Which of the following pairs includes an expression that CANNOT replace the underlined expression in the passage?

① (a) undermine, weaken
② (b) commissioned, incentivized
③ (c) fertile, productive
④ (d) deflecting, turning away
⑤ (e) battered, damaged

17. (1.1 points) Which of the following would best fit in blank (1) in paragraph [B]?

① disinformation spreaders were falsely claiming the floods were the result of three dams' gates being opened.
② parts of cities in the central and southern regions experienced more than 400 forest fires amid extreme heat and drought.
③ wildfires at the time were mainly caused by a combination of factors.
④ some social media companies have implemented content moderation guidelines to curb climate change misinformation on their platforms.
⑤ this helped steer the online conversation away from the impact of climate change and how it can exacerbate flooding.

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

[A] Why would people simply hand over something precious or valuable when they could use it themselves? To me as an anthropologist, this is an especially powerful question because giving gifts likely has ancient roots. And gifts can be found in every known culture around the world. Gifts serve lots of purposes. Some psychologists have observed a "warm glow"— an intrinsic delight— that's associated with giving presents. ❶ Theologians have noted how gifting is a way to express moral values such as love, kindness, and gratitude in Catholicism, Buddhism, and Islam. And philosophers ranging from Seneca to Friedrich Nietzsche regarded gifting as the best demonstration of selflessness. It's little wonder that gifts are a central part of Hanukkah, Christmas, Kwanzaa, and other winter holidays. ❷ But of all the explanations for why people give gifts, the one I find most convincing was offered in 1925 by a French anthropologist named Marcel Mauss.

[B] Like many anthropologists, Mauss was puzzled by societies in which gifts were extravagantly given away. For example, along the northwest coast of Canada and the United States, indigenous peoples conduct potlatch ceremonies. In these days-long feasts, hosts give away immense amounts of property. ❸ Mauss sees potlaches as an extreme form of gifting. Yet, he suggests this behavior is totally recognizable in most every human society. ❹

[C] Mauss observed that gifts create three separate but inextricably related actions. Gifts are given, received, and reciprocated. The first act of giving establishes the virtues of the gift giver. They express their generosity, kindness, and honor. ❺ The act of receiving the gift, in turn, shows a person's willingness to be honored. This is a way for the receiver to show their own generosity that they are willing to accept what was offered to them. The third component of gift giving is reciprocity, returning in kind what was first given. In this way, gifting becomes an endless loop of giving and receiving, giving and receiving.

[D] This last step— reciprocity— is what makes gifts unique. Unlike buying something at a store, in which the exchange ends when money is traded for goods, giving gifts builds and sustains relationships. This relationship between the gift giver and receiver is bound up with morality. Gifting is an expression of fairness because each present is generally of equal or greater value than what was last given. And gifting is an expression of respect because it shows a willingness to honor the other person. In these ways, gifting tethers people together. It keeps people connected in an infinite cycle of mutual obligations.

18. (1.1 points) Which of the following is NOT true about gift giving according to the above passage?

① Gifts serve various purposes, including expressing moral values such as love, kindness, and gratitude.

② Some psychologists associate giving presents with an intrinsic delight or "warm glow."

③ Gift giving can be found in every known culture around the world.

④ Philosophers, such as Seneca and Friedrich Nietzsche, regarded gifting as the best demonstration of selflessness.

⑤ Giving gifts aligns with economic or evolutionary rationality, so it remains a prevalent practice in various cultures.

19. (1.1 points) The following sentence is removed from the above passage. In which part may it be inserted to support the argument made by the author?

> Consider a famous potlatch in 1921, held by a clan leader of the Kwakwaka'wakw Nation in Canada who gave community members 400 sacks of flour, heaps of blankets, sewing machines, furniture, canoes, gas-powered boats, and even pool tables.

① ❶　　② ❷　　③ ❸　　④ ❹　　⑤ ❺

20. (1.1 points) Which of the following is NOT true about Marcel Mauss' observations on gift giving?

① Mauss suggests that gift giving establishes virtues, such as generosity and kindness in the gift giver and shows the receiver's willingness to be honored.

② Mauss's perspective implies that the practice of giving and receiving gifts is a widespread phenomenon found in various societies and cultures.

③ According to Mauss, the process of giving and receiving gifts is tied to moral values and social connections.

④ Mauss observes that giving gifts forms an endless loop of mutual obligations between the gift giver and receiver.

⑤ Mauss suggests that the cycle of giving, receiving, and reciprocating transfers the value of social solidarity to future generations.

21. (1.0 points) Which of the following is the LEAST relevant keyword for Mauss' observations on gift giving?

① contemporary context
② cultural practices
③ human society
④ psychological aspects
⑤ reciprocity

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

[A] Our ability to process verbal language is not based solely on semantics, i.e. the meaning and combination of linguistic units. Other parameters come into play, such as prosody, which includes pauses, accentuation, and intonation. Affective bursts "Aaaah!" or "Oh!", for example, are also part of this, and we share these with our primate cousins. They contribute to the meaning and understanding of our vocal communications. When such a vocal message is emitted, these sounds are processed by the frontal and orbitofrontal regions of our brain. The function of these two areas is, among other things, to integrate sensory and contextual information leading to a decision.

[B] Are they activated in the same way when we are exposed to the emotional vocalizations of our close cousins— the chimpanzees, macaques, or bonobos? Are we able to differentiate between them? A research team sought to find this out by exposing a group of 25 volunteers to various human and simian vocalizations. "The participants were placed in an MRI scanner and were given headphones. After a short period of familiarization with the different types of vocalizations, each participant had to categorize them, i.e. identify to which species they belonged," explains Leonardo Ceravolo, first author of the study.

[C] These vocalizations were of the affiliative type, i.e. linked to a positive interaction, or of the agonistic type, i.e. linked to a threat or distress. The results show that for macaque and chimpanzee vocalizations, the frontal and orbitofrontal regions of the participants were activated in a similar way to human vocalizations. The participants were able to differentiate between them easily.

[D] On the other hand, when confronted with the "sounds" of bonobos, also close cousins of humans, the involved cerebral areas were much less activated, and categorization was at chance level. "It was thought that kinship between species— the 'phylogenetic distance'— was the main parameter for having the ability, or not, to recognize these different vocalizations. We thought that the closer we were genetically, the more important this ability was," explains Didier Grandjean, who led the study. "Our results show that a second parameter comes into play: acoustic distance. The further the dynamics of the acoustic parameters, such as the frequencies used, are from those of humans, the less certain frontal regions are activated. Bonobo calls are very high-pitched and can sound like those of certain birds. This acoustic distance in terms of frequencies, compared with human vocalizations, explains our inability to decode them, despite our close phylogenetic proximity."

22. (1.1 points) Which of the following is NOT a method of data collection of the research described in the passage?

① Volunteers are exposed to various types of vocalizations from both humans and different species of primates.

② The researchers systematically controlled the sequence and presentation of vocalizations by randomizing or structuring the order.

③ The participants are placed in an MRI scanner while exposed to these vocalizations.

④ Before the categorization task, the participants are given a short period to familiarize themselves with the different types of vocalizations.

⑤ Participants are required to identify to which species (human, chimpanzee, macaque, or bonobo) each vocalization belongs.

23. (1.0 points) Which of the following is the LEAST relevant keyword for the research?

① Acoustic Variations
② Brain Activation
③ Cognitive Ability
④ Genetic Proximity
⑤ Vocalization

24. (1.1 points) Among the following questions, to which does the study NOT provide an answer?

① Can humans differentiate between these simian vocalizations?

② Are humans capable of identifying the different emotional aspects of affiliative or agonistic vocalizations emitted by a bonobo?

③ Are the frontal and orbitofrontal regions of the brain activated similarly when exposed to semian and human vocalizations?

④ What role does phylogenetic proximity versus acoustic distance play in the brain's response to and recognition of vocalizations among different primate species?

⑤ What factors influence the ability of humans to distinguish between the simian sounds?

25. (1.1 points) Which of the following is LEAST likely to be inferred from paragraph [D]?

① The acoustic divergence makes it challenging for humans to decode or categorize bonobo vocalizations.

② Despite bonobos being close cousins of humans in terms of genetic relatedness, participants had difficulty categorizing bonobo vocalizations.

③ The acoustic properties of bonobo vocalizations create a significant acoustic difference from human vocalizations.

④ The study reveals that phylogenetic proximity is not the factor influencing our ability to identify the simian sounds but the acoustic proximity is a determining factor.

⑤ It was believed that the ability to recognize vocalizations was primarily linked to the genetic closeness or phylogenetic proximity between the species.

※ 문제 26 – 44

물음에 답하라.

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[26] [0.8점] 곡선 $y^2 + 4x = \ln y - \ln 2$ 위의 점 $(-1, 2)$에서의 접선의 기울기를 구하라.

① 1　　　　② $-\dfrac{7}{8}$　　　③ $-\dfrac{8}{7}$　　　④ $\dfrac{7}{8}$　　　⑤ $\dfrac{8}{7}$

[27] [0.8점] 다음 중 $\cos^{-1}\left(\sin\left(\dfrac{2024\pi}{7}\right)\right)$를 간단히 한 것을 고르라.

① $\dfrac{9\pi}{14}$　　　② $\dfrac{6\pi}{7}$　　　③ $\dfrac{\pi}{7}$　　　④ $-\dfrac{\pi}{7}$　　　⑤ $-\dfrac{6\pi}{7}$

[28] [0.8점] <**아래**> 극한을 구하라.

< 아래 >

$$\lim_{n \to \infty}\left(1 - \sin\left(\dfrac{2}{\sqrt{n}}\right)\right)^n$$

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

[29] [0.8점] 열린구간 $(-2, 2)$에서 정의된 두 번 미분 가능한 함수 f를 생각하자. <**보기**>의 내용 중 옳은 것은 **모두** 몇 개인가?

< 보기 >

가. 만약 f가 0에서 최댓값을 가지면, $f'(0) = 0$이 성립한다.

나. 만약 $f'(0) > 0$이면, f는 0을 포함한 적당한 열린구간에서 순증가이다.

다. $f'(0) = 0$일 때, f가 0에서 극솟값을 갖기 위한 필요충분조건은 $f''(0) > 0$이다.

라. 만약 $f'(-1) = f'(1) = 0$이면, $f''(c) = 0$을 만족하는 c가 존재한다.

① 0개　　　② 1개　　　③ 2개　　　④ 3개　　　⑤ 4개

[30] [0.8점] 매개변수 곡선 $x(t) = t - \sin t$, $y(t) = 1 - \cos t$ 위의 점 $\left(\dfrac{2\pi}{3} - \dfrac{\sqrt{3}}{2}, \dfrac{3}{2}\right)$에서의 접선의 기울기를 구하라.

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

[31] [1.0점] 곡선 $y = \displaystyle\int_{\frac{\pi}{4}}^{x} \sqrt{\tan^6 t - 1} \, dt$ $(\frac{\pi}{4} \le x \le \frac{\pi}{3})$의 길이를 구하라.

①　$1 - \dfrac{1}{2}\ln 2$　　　　②　$1 + \dfrac{1}{2}\ln 2$　　　　③　$1 - \ln 2$

④　$1 + \ln 2$　　　　⑤　1

[32] [1.0점] 실수로 이루어진 수열 $\{a_n\}$에 대한 <보기>의 내용 중 옳은 것은 <u>모두</u> 몇 개인가?

< 보기 >

가. 수열 $\{|a_n|\}$이 단조감소(monotone decreasing)이고 $\displaystyle\lim_{n \to \infty} a_n = 0$이면,

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

나. 무한급수 $\displaystyle\sum_{n=1}^{\infty} a_n^2$이 수렴하면, 무한급수 $\displaystyle\sum_{n=1}^{\infty} a_n^4$은 수렴한다.

다. 무한급수 $\displaystyle\sum_{n=1}^{\infty} a_n^2$이 발산하면, 무한급수 $\displaystyle\sum_{n=1}^{\infty} a_n$은 발산한다.

라. 무한급수 $\displaystyle\sum_{n=1}^{\infty} (-1)^n a_n$이 수렴하면, 무한급수 $\displaystyle\sum_{n=1}^{\infty} \dfrac{a_n}{2^n}$은 수렴한다.

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①　0개　　②　1개　　③　2개　　④　3개　　⑤　4개

[33] [1.1점] 실수 t에 대하여 $f(t) = [t] - 2\left[\dfrac{t}{\sqrt{2}}\right] + 3\left[\dfrac{t}{\sqrt{3}}\right]$라 두자. 여기서 $[t]$는 t를 넘지 않는 가장 큰 정수를 의미한다. **<아래>** 식을 만족하는 유리수 a, b, c에 대하여 $a+b+c$를 구하라.

< 아래 >
$$\int_0^3 f(x)\, dx = a + b\sqrt{2} + c\sqrt{3}$$

①　-3　　②　3　　③　0　　④　-1　　⑤　1

[34] [1.0점] <보기>에서 수렴하는 이상 적분(improper integral)은 <u>모두</u> 몇 개인가?

< 보기 >

가. $\displaystyle\int_0^{\pi/2} \dfrac{x\sqrt{x}}{\sin^2 x}\, dx$　　　　　　　　**나.** $\displaystyle\int_0^{2024} \dfrac{x\sqrt{x}}{\sin^2 x}\, dx$

다. $\displaystyle\int_{2024}^{\infty} e^{-\sqrt{(\ln x)^3}}\, dx$　　　　　**라.** $\displaystyle\int_0^{2024} \dfrac{\cos x}{\sqrt{x}}\, dx$

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①　0개　　②　1개　　③　2개　　④　3개　　⑤　4개

[35] [1.1점] <**아래**> 이상 적분을 구하라.

> < **아래** >
> $$\int_0^1 \frac{e^{-1/x}\,dx}{x^4}$$

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

[36] [1.0점] <**아래**> 무한급수의 합을 구하라.

> < **아래** >
> $$\sum_{n=1}^{\infty} \frac{n^2}{3^n}$$

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

[37] [1.0점] 수열 $\{a_n\}$이 n이 짝수이면 $a_n = (-1)^{n/2}$, n이 홀수이면 $a_n = (-1)^{(n+1)/2}$으로 정의되었을 때, <**아래**> 무한급수의 합을 구하라.

> < **아래** >
> $$\sum_{n=1}^{\infty} a_n \frac{\pi^n}{3^n n!}$$

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

[38] [1.1점] <**아래**> 이상 적분을 구하라.

> < **아래** >
> $$\int_0^1 \cos^2(\ln x)\,dx$$

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

[39] [1.1점] <**아래**> 극한을 구하라.

<div style="border:1px solid">

< 아래 >

$$\lim_{n \to \infty} \sum_{k=1}^{n} \frac{\sqrt{n}+k}{n^2} \cos\left(\frac{\pi k}{2n} + \frac{\sqrt{2\pi}}{\sqrt{n}}\right)$$

</div>

  ① 발산   ② π ③ $\dfrac{\pi}{2}$ ④ $\dfrac{1}{\pi} - \dfrac{1}{\pi^2}$ ⑤ $\dfrac{2}{\pi} - \dfrac{4}{\pi^2}$

[40] [1.1점] 평면 상의 영역 $R = \{(x,y) : 1 \le x^2 + y^2 \le 4, \, y \ge |x|\}$을 생각하자. R 모양의 얇은 판(lamina)의 각 점에서의 밀도가 원점으로부터의 거리에 비례한다고 할 때 이 얇은 판의 질량중심의 y좌표를 구하라.

  ① $\dfrac{22\sqrt{3}}{7\pi}$ ② $\dfrac{45\sqrt{3}}{14}$ ③ $\dfrac{45\sqrt{3}}{14\pi}$

  ④ $\dfrac{45\sqrt{2}}{14}$ ⑤ $\dfrac{45\sqrt{2}}{14\pi}$

[41] [1.1점] <**아래**> 값을 구하라.

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< 아래 >

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \int_{\sqrt{y}}^{\frac{\sqrt{\pi}}{2}} \frac{y\cos(x^2)}{x^3} \, dx\,dy + \int_{0}^{\frac{\pi}{6}} \int_{\sqrt{\frac{\pi}{6}}}^{\frac{\sqrt{\pi}}{2}} \frac{y\cos(x^2)}{x^3} \, dx\,dy$$

</div>

  ① $\dfrac{1}{4\sqrt{2}}$ ② $\dfrac{1}{8\sqrt{2}}$ ③ $\dfrac{1}{8}(\sqrt{2}-1)$

  ④ $\dfrac{1}{8}(\sqrt{2}+1)$ ⑤ $\dfrac{1}{4}$

[42] [1.0점] 곡면 $x^2 - y^2 - 2z^2 = 1$ 위의 점 $(2,1,-1)$에서의 접평면은 z축과 $(0,0,a)$에서 만난다. 이때 a의 값을 구하라.

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

[43] [1.0점] 함수 $f(x,y) = (x-2y)^4$ 의 $(3,1)$ 에서의 선형근사함수(linear approximation)를 이용한 $f(2.9, 1.2)$ 의 근삿값을 구하라.

　① -1.0 　② -0.5 　③ 0.6 　④ 0.9 　⑤ 1.2

[44] [1.1점] 영역 $\{(x,y) : 3x^2 + y^2 \leq 1\}$ 에서 정의된 함수 $f(x,y) = 3x^3 - y^3$ 의 최댓값을 M, 최솟값을 m 이라 할 때 $M-m$ 의 값을 구하라.

　① $\sqrt[3]{2}$ 　② $2\sqrt[3]{2}$ 　③ $2\sqrt{2}$ 　④ 1 　⑤ 2

※ 문제 45 – 47

실수 전체 집합에서 정의된 미분가능 함수 f 가 아래 **<성질>**을 만족한다.

< 성질 >

가. $f(1) = 2$ 　　나. $f(2) = 3$

다. $f(3) = 5$ 　　라. $f'(1) = \dfrac{1}{2}$

마. $f'(2) = \dfrac{5}{2}$ 　　바. $f'(3) = \dfrac{7}{3}$

사. $\displaystyle\int_1^2 f(x)\,dx = \dfrac{13}{6}$ 　　아. $\displaystyle\int_1^2 xf(x)\,dx = 3$

자. 모든 x에 대하여 $f'(x) > -1$

함수 $f(x) + x$의 역함수를 g라 하자. 물음에 답하라.

---

[45] [1.0점] $g'(5)$의 값을 구하라.

　① $\dfrac{1}{7}$ 　② $\dfrac{2}{7}$ 　③ $\dfrac{3}{7}$ 　④ $\dfrac{1}{5}$ 　⑤ $\dfrac{2}{5}$

[46] [1.0점] 아래 정적분의 값을 구하라.

$$\int_3^5 g(x)\,dx$$

　① $\dfrac{7}{3}$ 　② $\dfrac{5}{2}$ 　③ 3 　④ $\dfrac{10}{3}$ 　⑤ 4

[47] [1.1점] 곡선 $y = g(x)$ $(3 \leq x \leq 5)$의 아래 부분을 x축 주위로 회전하여 얻은 입체의 부피를 구하라.

　① $\dfrac{19}{3}\pi$ 　② $\dfrac{11}{3}\pi$ 　③ $\dfrac{10}{3}\pi$ 　④ 3π 　⑤ 2π

※ 문제 48 - 50

평면 상의 벡터장 $\mathbf{F}(x,y) = \left\{ -\dfrac{y}{x^2+y^2} + ye^{xy} \right\}\mathbf{i} + \left\{ \dfrac{x}{x^2+y^2} + xe^{xy} \right\}\mathbf{j}$ 을 생각하자.
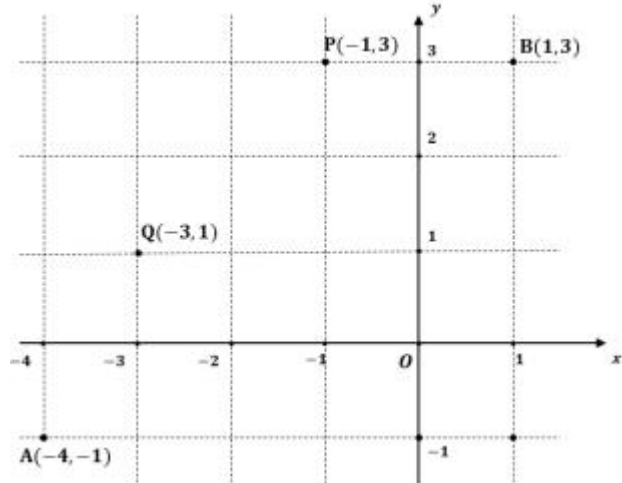
오른쪽 그림을 참조하라.
점 P에서 점 Q에 이르는 선분을 C_1,
점 A에서 점 B에 이르는 선분을 C_2,
점 A에서 점 B, 그리고 점 Q를
거쳐 점 A로 돌아오는 삼각형 모양의
곡선을 C_3라 하자.

물음에 답하라.

[48] [1.1점] <아래> 선적분을 구하라.

< 아래 >

$$\int_{C_1} \mathbf{F} \cdot d\mathbf{r}$$

① $2\tan^{-1}3 - \dfrac{\pi}{2}$ ② $2\tan^{-1}\dfrac{1}{3} - \dfrac{\pi}{2}$ ③ $2\tan^{-1}3$

④ $-2\tan^{-1}3$ ⑤ $-2\tan^{-1}\dfrac{1}{3}$

[49] [1.1점] 점 A에서 시작하여 원점을 거치지 **않고** 좌표 축과 나란한 직선(그림 상의 점선 또는 좌표축)을 따라 한 칸씩 이동하여 점 B에 이르는 최단 경로 C 중, <아래> 식을 만족하는 것은 **모두** 몇 개인가?

< 아래 >

$$\int_{C} \mathbf{F} \cdot d\mathbf{r} = \int_{C_2} \mathbf{F} \cdot d\mathbf{r}$$

① 25   ② 50   ③ 55   ④ 100   ⑤ 105

[50] [1.0점] <아래> 선적분을 구하라.

< 아래 >

$$\int_{C_3} (-y\,dx + x\,dy)$$

① 2   ② 4   ③ -4 ④ 6   ⑤ -6