튜나 기출풀이 정규과정 (9월 ~ 12월)

화요일 - 파트별(어휘/문법/독해/논리)로 문제풀이 후, **파트별 해설**

금요일 - **실제시험지 크기 + OMR + 실제시험시간** -> 문풀 후, 해설

튜나 기출풀이 정규과정의 목표

1) 해당학교의 문항별 특색을 익히고, 문제접근방법을 익혀 오답률을 줄여나가는 과정

2) 문항별 시간배분방법, 실전감각까지 모두 가져가기

	해설강의 (60분 + @)	문제풀이 및 해설 (150분 + @)	과제
9월 15일		성균관대 2011	성균관대 2012 오전
9월 19일	성균관대 2012오전	성균관대 2012오후	성균관대 2013 오전
9월 22일	성균관대 2013 오전	성균관대 2013 오후	성균관대 2014
9월 26일	성균관대 2014	성균관대 2015	성균관대 2016
9월 30일	성균관대 2016	성균관대 2017	성균관대 2018
10월 3일	성균관대 2018	성균관대 2019	성균관대 2020
10월 6일	성균관대 2020	성균관대 2021	성균관대 2022
10월 10일	성균관대 2022	성균관대 2023	한국외대 19A
10월 13일	한국외대 19A	한국외대 19C	한국외대 20A
10월 17일	한국외대 20A	한국외대 20C	한국외대 21 T1
10월 20일	한국외대 2 T1	한국외대 21 T2	한국외대 21 T3
10월 24일	한국외대 21 T3	한국외대 22 T1	한국외대 22 T2
10월 27일	한국외대 22 T2	한국외대 23 T1	한국외대 23 T3
10월 31일	논리,빈칸 난이도 극악인 한양대, 서강대 대비하기위한 빈칸추론 + 더블블랭크/트리플블랭크 대비 강의		
11월 3일	논리,빈칸 난이도 극악인 한양대, 서강대 대비하기위한 빈칸추론 + 더블블랭크/트리플블랭크 대비 강의		
11월 7일	논리,빈칸 난이도 극악인 한양대, 서강대 대비하기위한 빈칸추론 + 더블블랭크/트리플블랭크 대비 강의		
11월 10일	논리,빈칸 난이도 극악인 한양대, 서강대 대비하기위한 빈칸추론 + 더블블랭크/트리플블랭크 대비 강의		
11월 14일		중앙대 17A,C	중앙대 18A,C
11월 17일	중앙대 18A,C	중앙대 19A,C	중앙대 20,21
11월 21일	중앙대 22,23	이화여대 텐블랭크 12년~16년	이화여대 17,18
11월 24일	이화여대 17,18	이화여대19	이화여대 20,21
11월 28일	이화여대 20,21	이화여대22	이화여대 23
12월 1일	이화여대 23	한양대 2014, 2015	한양대 16,17
12월 5일	한양대 16,17	한양대17,18	한양대 19,20
12월 8일	한양대19,20	한양대21,22	한양대 23
12월 12일	한양대 23	서강대13,14	서강대 15,16
12월 15일	서강대 15,16	서강대17,18	서강대 19,20
12월 19일	서강대 19,20	서강대21,22	서강대 23
12월 22일	서강대 23	기출 리와인드 및 앞으로의 방향성 질의응답 마무리	

기출과정문의는 https://tunatransfer.co.kr

2023학년도
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) People who feel a lack of personal control in their lives are more likely to prefer a culture that imposes order. These "tighter" cultures, in turn, _____ their existence by reducing individuals' sense of personal control and increasing their sense of collective control.

① demonstrate
② establish
③ jeopardize
④ perpetuate
⑤ reveal

2. (0.8 points) More than 45% of the world's civilian-owned firearms are in the United States, where just 5 percent of the world's people live. This _____ may have something to do with the way the majority of American gun owners view gun ownership.

① bias
② correlation
③ disparity
④ parallel
⑤ symmetry

3. (0.8 points) A team of researchers has discovered new insights into the evolution of color patterns in frogs and toads—collectively known as anurans. Animal color patterns can help them camouflage with their surroundings and avoid _____ from preys or predators. Many anurans have a light stripe along their back, which, when observed from above, creates the optical illusion that the animal is split in two halves, which confuses visually-oriented predators.

① confrontation
② contamination
③ detection
④ disruption
⑤ temptation

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

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4. (0.8 points) Black holes are the most extreme objects in the Universe. Supermassive versions of these unimaginably dense objects likely reside at the centers of all large galaxies. Stellar-mass black holes, _____ the mass of the Sun, are much more common with an estimated 100 million in the Milky Way alone.

① what are weighted approximately as 100 times
② what weight approximately as 100 times as
③ which weigh approximately 100 times
④ which weigh approximately 100 times as
⑤ which are weighed approximately 100 times

5. (1.0 points) Research indicates that the best ads ask questions and allow readers and viewers to form their own conclusions. If Honda had hammered away that the Element, a compact crossover SUV, was for young people, this strong definition _____ buying it. Some stimulus ambiguity can lead to a broader market definition and more spontaneous purchases.

① has blocked older drivers from
② might block older drivers
③ have might blocked older drivers from
④ might have older drivers blocked
⑤ might have blocked older drivers from

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) Many therapists believe that self-disclosure, especially around tricky topics like politics and religion, ①is generally something to be avoiding. If a patient asks a question ②deemed too personal, it is often standard to decline to answer, remind them that their welfare is the priority, and refocus the conversation on their needs. In some cases, a therapist may also choose ③to further explore why the question was asked. But political self-disclosures may be ④more common than people think. In a pair of surveys of 268 therapists and 604 patients conducted after the 2016 election, about two thirds of each group reported political discussions and self-disclosures. When political views ⑤were aligned, those disclosures were linked to a stronger therapeutic alliance.

7. (1.0 points) Holiday experiences are ①an opportunity for female travellers ②to reflect more on their personal relationships while males ③might have a less reflective approach to change and be ④more orienting towards ⑤mastering a specific activity.

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

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8. (1.1 points) The inner solar system consists of the sun, eight planets, their moons, and the countless other celestial bodies that orbit the sun between the planets. There are also innumerable objects in the realm beyond the last planet in the region that has been termed as the outer solar system. These objects include several dwarf planets and their moons, comets, and various small icy and rocky objects that are too small to be classified as either. The boundary of the solar system is the limit of the sun's gravitational pull since any objects that get caught by its gravity will begin to orbit the sun. So far, the most distant object discovered that orbits the sun is approximately sixty-eight astronomical units from the sun, yet some astronomers believe that the sun's pull may extend even further than that.

(a) Any object that orbits the sun is within the sun's gravitational pull.
(b) Objects that are in the outer solar system are not caught by the sun's gravity.
(c) The outer solar system consists of dwarf planets with their moons, comets, and a variety of unclassified small objects.
(d) The farthest object within the sun's gravitational pull identified so far may be more distant than some scientists assumed it to be.

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

9. (1.1 points) Shoppers, retailers, and manufacturers alike feel the effects of customer reviews. Researchers looked at the influence of the first review after noticing the exact same products getting positive reviews on one retailer's website but negative reviews on others, said Park, who studied the phenomenon. "Why would a product receive a 4.7-star rating with 100 reviews on Amazon, but only four or five reviews with a two-star rating on Walmart or Best Buy?" Park wondered. By comparing identical vacuum cleaners, toasters, and digital cameras on Amazon and Best Buy, Park and his team were able to isolate the first review as the variable in how the product fared. They showed that the first review can affect a product's overall reviews for up to three years, influencing both the amount and the tone of later reviews.

(a) User reviews are more trustworthy than information from advertizing.
(b) Average rating of a product has more lasting effect than a single rating.
(c) A product's first review can have an outsized effect on the item's future reviews.
(d) The first review has the potential to sway the entire evolution path of online consumer reviews.

① (a) & (b)
② (b) & (c)
③ (c) & (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] The outbreak of the French Revolution in 1789 was greeted with enthusiasm by most Americans for it confirmed their faith that their own Revolution (a) had blazed a trail to liberty that all humanity would eventually follow. However, widespread "Bastille fever" lasted only so long as the revolution in France remained relatively moderate. As the great (b) upheaval moved into a new and (c) more somber phase, American ardor cooled, and public opinion divided sharply.

[B] The people who tended toward Federalism in domestic politics were shocked by the execution of Louis XVI and the wholesale guillotining of political opponents. When the revolutionary agitation spread to other countries, followed by French revolutionary armies, conservative Americans were driven into hysterical fears of mob rule, atheism, and Jacobinism at home. On the other hand, more democratic-minded Americans, who often deplored the worst excesses of the "reign of terror," remained steadfast in their support of the goals of the French Revolution. Jefferson, for one, did not applaud the beheadings, but he believed that the liberty of the whole earth depended on the triumph of liberty, equality, and fraternity in France. (1) _____

[C] The French Revolution (d) precipitated a great European war, lasting with brief interruptions from 1793 until 1815 and putting France against a series of European coalitions headed by Great Britain. American leaders of all persuasions agreed that their infant nation should avoid becoming directly involved on either side, but there were sharp differences in sympathies.

[D] The Hamiltonians favored the British, partly out of a preference for British conservatism as opposed to French radicalism and partly because the large trade with Great Britain enriched the merchant class and provided 90 percent of the tariff revenues essential to Hamiltonian financial policies. Jefferson and his friends, more sympathetic to French aims, argued that the country owed its independence to the Franco-American alliance of 1778, which was still in force, and urged a neutrality that would be (e) benevolent toward France.

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

① Launching the New Government Led to Democracy
② The French Revolution Divided American Sentiments
③ The Radical Program Increased Public Interests in Politics
④ The Perils of Neutrality Invoked the Alliance Among Nations
⑤ An Empire Determined to Avoid a Break from the Continent

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

① Actually, France did not want to invoke the alliance to bring the U.S. into the war as a belligerent.
② To Jefferson and his followers, the conservative reaction was proof that their Federalist opponents were really monarchists.
③ Washington's proclamation of American neutrality made considerable sense economically.
④ Jefferson had already resigned in disgust at his opponent's domination of the administration and interference in the affairs of the State Department.
⑤ Commercial interests and producers of exports in the U.S. entered upon a period of unparalleled prosperity.

12. (0.8 points) Which of the following pairs includes an expression that CANNOT replace the underlined expression in the passage?

① (a) had blazed a trail, had pioneered
② (b) upheaval, major change
③ (c) more somber phase, clearer stage
④ (d) precipitated, caused to happen
⑤ (e) benevolent, kind and generous

13. (1.1 points) According to the above passage, which of the following is true?

① American political leaders believed that their country should make strong coalitions with major European nations.
② American people supported the goals of the French Revolution, which included liberty, equality, and fraternity regardless of their political beliefs.
③ Jefferson and his followers welcomed the guillotining of political opponents.
④ The American enthusiasm about the French revolution lasted for a long time unaffected by any changes in the revolution in France.
⑤ The conservative Americans were in support of the British partly because of trade and financial reasons.

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

[A] The magician snaps his fingers and a ball disappears right in front of your eyes. "How is this possible?" you ask yourself. You have a pretty good understanding of how objects behave, and you know from experience that objects cannot simply disappear into thin air, yet this is exactly what you see. Magic is one of the oldest art forms, and since written records began, (a) magicians have been baffled and amazed their audiences by creating illusions of the impossible. While most of their tricks remain precious secrets, scientists, myself among them, (b) have started studying magic to gain insights into how and why our minds are so easily deceived. ❶

[B] (1)_____. It creates a conflict between (c) the things you think can happen and the things that you experience. While some magicians would like you to believe that they possess real magical powers, the true secret behind magic lies in clever psychological techniques that exploit limitations in the way our brains work. ❷ Many of these limitations are very counter-intuitive, which is why we can experience the magical wonder of the impossible.

[C] How? Let's start with the basics. Vision is our most trusted sense, and influences many of our thoughts and behaviors. In fact, vision (d) is so important that we often don't believe things until we see them with our own eyes. ❸ But it turns out that our visual experiences are far less reliable than we intuitively think. It's relatively easy to distort your perceptual experience, and these distortions become very apparent when we look at visual illusions. Visual illusions occur when there is a mismatch between your perceptual experience and the true state of the world. ❹

[D] We are often surprised by how these illusions deceive us, but it turns out that pretty much all of our perception is an illusion, whether we are walking down the street or attempting to decipher the latest card trick. Intuitively, we think of our eyes as simply capturing truthful images of the world. But in reality, our visual experience (e) results from complex neuronal processes that make clever estimates about what the world is like. And as with all predictions, they are never 100% correct. This leads to errors, and it is these errors that magicians have mastered and exploited. ❺

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

① Tricking the Brain: How Magic Works
② Ignoring the Present: Why the Future Matters
③ Seeing the Future: What Triggers the Illusions
④ Exploiting Attentional Limitations: Which Our Mind Prefers
⑤ Developing Efficient Strategies: When the Brain Cooperates

15. (1.1 points) The following sentence is removed from the passage. In which part may it be inserted to support the argument made by the author?

In the Müller-Lyer illusion, for example, the top line appears shorter than the bottom, although they are exactly the same length.

① ❶ ② ❷ ③ ❸ ④ ❹ ⑤ ❺

16. (0.8 points) Choose the underlined word or phrase that must be changed for the sentence to be correct.

① (a) magicians have been baffled and amazed their audiences
② (b) have started studying magic
③ (c) the things you think can happen
④ (d) is so important that
⑤ (e) results from

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

① Magic allows you to experience the impossible.
② Processing large amounts of information is computationally expensive.
③ The vanishing ball illusion is one trick that colleagues and I have studied.
④ Intuitively, we feel that we are aware of most of our surroundings and experiences.
⑤ A further misconception about visual experience relates to the amount of detail that we think we are aware of.

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

[A] Humans spend nearly a third of their lives asleep. Going without sleep will literally make you psychotic, and eventually kill you. It's clear that shut-eye is crucial to the body's ability to function. But no one knows what sleep actually does. Scientists have a number of theories. ❶ One is that sleep restores the brain's energy, according to a 2016 review in the journal *Sleep Medicine Reviews*. During non-REM sleep, the brain consumes only about half the glucose as it does when a person is awake. (Glucose is the sugar that cells burn up to release energy.) But if the idea that sleep restores brain energy is true, the relationship between sleep and the brain's energy usage is not straightforward. For example, during sleep deprivation, the brain's breakdown of an energy source called glycogen increases in some parts of the brain but decreases in others. More research is needed to understand this link. ❷

[B] Another idea is that sleep might enable the brain to clear out toxic products produced when we're awake. The brain is a huge consumer of energy, which means it also produces much waste. Some recent research suggests that sleep is a time when the brain sweeps itself clean, Marcos Frank, a neuroscientist at the University of Washington, said, but those results need to be replicated. "It might be something that kind of happens with sleep," Frank said, "but it may not be the most important thing sleep is doing." ❸

[C] Perhaps the most promising theory of sleep so far is that it plays a major role in the brain's connectivity and plasticity. Plasticity is involved in learning and memory. ❹ Although it's unclear exactly how, plenty of evidence suggests that losing sleep can cause problems with memory, particularly working memory, the process that allows people to hold information in an easily accessible way while working out a problem. People who are sleep-deprived also struggle with choosing what to pay attention to and regulating their emotions.

[D] One way sleep may affect the brain's plasticity is through its effects on the synapses or connections between neurons. Research has shown that when animals learn a new task, their neurons seem to strengthen the synaptic connections involved in learning that task during the next sleep cycle according to the *Sleep Medicine Reviews* paper. ❺

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

① Why do We Need to Sleep?
② Why is Sleep Difficult to Study?
③ How does Sleep Deprivation Affect Us?
④ What is Happening in Our Brain During Sleep?
⑤ How does Sleep Help to Reorganize the Brain?

19. (1.0 points) The following passage is removed from the above passage. In which part may it be inserted to support the argument made by the author?

In experiments where researchers put a patch over one of an animal's eyes, the brain circuits associated with visual information from that eye weakened within hours, according to research by the University of Surrey's Julie Seibt and colleagues. REM sleep, however, strengthened the circuits involving the other eye, suggesting that the brain uses sleep to adjust to changing inputs.

① ❶ ② ❷ ③ ❸ ④ ❹ ⑤ ❺

20. (1.1 points) Which of the following is LEAST likely to be inferred from the above passage?

① It is not clear why we need to sleep.
② It is hard to prove that sleep is important.
③ Sleep can be a brain-related phenomenon.
④ Sleep can help the brain's ability to reorganize itself.
⑤ More research is needed to solidify the idea that sleep is a time when the brain sweeps itself clean.

21. (1.1 points) Which of the following best supports the theory that sleep plays a major role in the brain's plasticity?

① People who are sleep-deprived struggle with regulating their emotions.
② During sleep deprivation, the brain's breakdown of glycogen increases.
③ Sleep deprivation affects the immune system and alters hormone levels in the body.
④ Sleep deprivation caused healthy people to have hallucinations and other schizophrenia-like symptoms.
⑤ Animals' neurons seem to strengthen the synaptic connections involved in learning a new task during the sleep cycle.

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

[A] There are many theories as to how religious thought originated. ❶ Acting for a purpose is the basis for what evolutionary scientists call the Theory of Mind (ToM), and this is an idea that's often cited in discussions about the origins of religion. ❷ By attributing intention or purpose to the actions of beings that did have (a) agency, like other people, humans stopped simply reacting as quickly as possible to the world around them. They started (b) anticipating what other beings' actions might be and planning their own actions accordingly. ToM enabled early humans to discern other people's positive and negative intentions (e.g., "Does that person want to mate with me or kill me and steal my food?"), thereby increasing their own chances of survival.

[B] ❸ But when people started attributing purpose to the actions of nonactors, like raindrops, ToM took a turn toward the supernatural. The roaring threat of a thunderstorm or the devastation of a flood is widely seen across cultures as the product of a dangerous personal agent in the sky or river, respectively. Likewise, the movements of the sun, moon, and stars are widely explained as the movements of personal agents with extraordinary powers. This tendency to explain the natural world through the existence of beings with supernatural powers (things like gods, ancestral spirits, goblins, and fairies) formed the basis for religious beliefs.

[C] ❹ Robin Dunbar, an evolutionary psychologist and anthropologist, thinks religion may have evolved as what he calls a "group-level adaptation." Religion is a "kind of glue that holds society together," Dunbar wrote. "Humans may have developed religion as a way to promote cooperation in social groups," Dunbar said. Primates tend to live in groups because doing so benefits them in certain ways. For instance, hunting in groups is more effective than hunting alone. But living in groups also has (c) drawbacks. Namely, some individuals take advantage of the system.

[D] ❺ "Freeriding is disruptive because it loads the costs of the social contract onto some individuals, while others get away with paying significantly less," Dunbar wrote. As a result, those who have been (d) exploited become less willing to support the social contract. In the absence of sufficient benefit to (e) outweigh these costs, individuals will leave in order to be in smaller groups that incur fewer costs. But if the group can figure out a way to get everyone to behave in an unselfish way, individual members of the group are less likely to storm off, and the group is more likely to remain cohesive. Religion may have naturally sprung up from this need to keep everybody on the same page.

22. (1.1 points) The following passage is removed from the above passage. In which part may it be inserted to support the argument made by the author?

But not everyone agrees that religious thinking is just a byproduct of evolution. Some scientists see religion as more of an adaptation—a trait that stuck around because the people who possessed it were better able to survive and pass on their genes.

① ❶ ② ❷ ③ ❸ ④ ❹ ⑤ ❺

23. (0.8 points) Which of the following pairs includes an expression that CANNOT replace the underlined expression in the passage?

① (a) agency, power
② (b) anticipating, expecting
③ (c) drawbacks, shortcomings
④ (d) exploited, devoted
⑤ (e) outweigh, compensate

24. (1.1 points) Which of the following is LEAST likely to be inferred from the above passage?

① The tendency to explain the natural world through the existence of beings with super-natural powers is found in different cultural groups.
② Early humans began to attribute supernatural powers to animals for survival.
③ Religion may have evolved to maintain social cohesiveness.
④ Freeriding can be detrimental to social cooperation.
⑤ The ToM was helpful for early humans.

25. (1.1 points) Which of the following would be the best title for the above passage?

① The Benefits of Social Cooperations
② Time and Space For Early Humans
③ Attributing Agency to Natural Movements
④ Byproducts of Cognitive Faculties
⑤ The Beginning of Religious Thought

※ 문제 26 - 38

물음에 답하라.

[26] [0.8점] 다음 중 **옳지 않은** 것을 고르라.

① $-1 \le x \le 1$을 만족하는 모든 실수 x에 대하여 $\sin^{-1}(\sin x) = x$가 성립한다.
② $-1 \le x \le 1$을 만족하는 모든 실수 x에 대하여 $\cos^{-1}(\cos x) = x$가 성립한다.
③ $-1 \le x \le 1$을 만족하는 모든 실수 x에 대하여 $\sin(\sin^{-1} x) = x$가 성립한다.
④ $-1 \le x \le 1$을 만족하는 모든 실수 x에 대하여 $\cos(\cos^{-1} x) = x$가 성립한다.
⑤ $-1 < x < 1$을 만족하는 모든 실수 x에 대하여 $\tan(\sin^{-1} x) = \dfrac{x}{\sqrt{1-x^2}}$가 성립한다.

[27] [0.8점] <보기>의 내용 중 옳은 것은 **모두** 몇 개인가?

< 보기 >

가. $\displaystyle\int_0^1 \sqrt{1+x^4}\,dx \le 1.2$

나. $\displaystyle\int_2^4 \frac{x^4}{x^6+x^3+1}\,dx \le 0.25$

다. $\displaystyle\int_0^{\pi/6} \cos(x^2)\,dx \ge 0.5$

라. $\displaystyle\int_0^{\pi/6} \sin^{-1}(x^2)\,dx \ge \int_0^{\pi/6} \sin(x^2)\,dx$

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

[28] [0.8점] $\sin\left(2\sin^{-1}\left(-\dfrac{1}{3}\right)\right)$을 간단히 하라.

① $-\dfrac{1}{9}\sqrt{2}$ ② $\dfrac{1}{9}\sqrt{2}$ ③ $-\dfrac{4}{9}\sqrt{2}$ ④ $\dfrac{4}{9}\sqrt{2}$ ⑤ $-\dfrac{2}{3}$

[29] [0.8점] <아래> 극한을 구하라.

< 아래 >

$$\lim_{x\to 0} \frac{\sin^{-1} x - x}{x^3}$$

① $\dfrac{1}{6}$ ② $-\dfrac{1}{6}$ ③ $\dfrac{1}{2}$ ④ $-\dfrac{1}{2}$ ⑤ 발산

[30] [0.8점] <**아래**> 극한을 구하라.

< 아래 >

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

① 발산 ② π ③ 1 ④ $\frac{1}{\pi}$ ⑤ 0

[31] [1.1점] 실수로 이루어진 수열 $\{a_n\}$에 대한 <**보기**>의 내용 중 옳은 것은 **모두** 몇 개인가?

< 보기 >

가. 수열 $\{a_n\}$이 단조감소(monotone decreasing)이고 무한급수 $\sum_{n=1}^{\infty}a_n^2$이 수렴하면, 무한급수 $\sum_{n=1}^{\infty}(-1)^n a_n$은 수렴한다.

나. 무한급수 $\sum_{n=1}^{\infty}a_n^2$이 발산하면, 무한급수 $\sum_{n=1}^{\infty}a_n^4$은 발산한다.

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

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

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

[32] [1.0점] <**보기**>에서 수렴하는 이상 적분(improper integral)은 **모두** 몇 개인가?

< 보기 >

가. $\int_0^{\pi/2}\frac{1}{\sqrt{\sin x}}\,dx$ **나.** $\int_0^{\pi/2}\frac{x}{\sqrt{\cos^3 x}}\,dx$

다. $\int_{2023}^{\infty}e^{-\sqrt{\ln x}}\,dx$ **라.** $\int_{2023}^{\infty}\frac{\cos x}{x}\,dx$

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

[33] [1.1점] 연속인 순증가 함수(strictly increasing function) $f:[0,2]\to[2,2\sqrt{5}]$가 $f(0)=2$, $f(2)=2\sqrt{5}$, 그리고 $\int_0^2\sqrt{f(x)^2+5}\,dx=7$를 만족한다. 이때 $\int_3^5 g\left(\sqrt{x^2-5}\right)dx$는 얼마인가? 단, g는 f의 역함수이다.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

[34] [1.0점] <**아래**> 정적분을 구하라.

< 아래 >

$$\int_{1/e}^{1} \frac{(\ln x)^2 dx}{x^2}$$

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

[35] [1.1점] 정적분으로 정의된 함수 $F(x)=\int_0^x \cos(t^2)\,dt$를 F의 5차 Maclaurin 다항식 (the fifth-degree Maclaurin polynomial of F) $P_5(x)$로 근사하려고 한다. 실수 x에 대하여 $E(x)=F(x)-P_5(x)$라 하자. <**보기**>의 내용 중 옳은 것은 **모두** 몇 개인가?

< 보기 >

가. $E(0.1)>0$이 성립한다. **나.** $E(-0.1)<0$이 성립한다.

다. $E(1)<\frac{1}{200}$이 성립한다.

라. $[-1,1]$에서의 $|F^{(9)}(x)|$의 최댓값을 M이라 하면, $E(1)\le\frac{M}{9!}$이 성립한다.

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

[36] [1.0점] 수열 $\left\{a_n=\frac{(-1)^n}{n^{1/4}(\ln n)^{1/4}(\ln(\ln n))^{1/3}} : n=3,4,5,\cdots\right\}$에 대하여 <**보기**>에서 수렴하는 것은 **모두** 몇 개인가?

< 보기 >

가. $\sum_{n=3}^{\infty} a_n$ **나.** $\sum_{n=3}^{\infty} a_n^2$

다. $\sum_{n=3}^{\infty} a_n^3$ **라.** $\sum_{n=3}^{\infty} a_n^4$

① 4개 ② 3개 ③ 2개 ④ 1개 ⑤ 0개

[37] [1.0점] <**아래**> 이상 적분을 구하라.

< 아래 >

$$\int_0^1 \sin(\ln x)\,dx$$

① 존재하지 않음 ② $-\frac{1}{2}$ ③ $\frac{1}{2}$

④ -2 ⑤ 2

[38] [1.1점] 곡면 $z=\sqrt{15}x+y^3+5$ 의 일부인 S 를 xy-평면 상으로 정사영 시켜 얻은 도형이 영역 $R=\{(x,y): x^{1/3}\le y\le 1,\ 0\le x\le 1\}$이라 하자. 이때 S의 넓이를 구하라.

① $\frac{61}{54}$ ② $\frac{61}{27}$ ③ $\frac{61\sqrt{5}}{54}$

④ $\frac{61\sqrt{5}}{27}$ ⑤ $\frac{61}{27}(\sqrt{5}-1)$

※ 문제 39 - 41

영역 $R=\{(x,y): |x|\le 1, |y|\le 1\}$ 에서 정의된 이변수 함수 $f(x,y)$를 생각하자.

$$f(x,y)=x^2+y^2+2x^2y+2$$

물음에 답하라.

[39] [1.0점] 함수 f 의 $\left(\frac{1}{2},\frac{1}{2}\right)$에서의 선형 근사(linear approximation) 함수는 $L(x,y)=ax+by+c$ 이다. 이때 $a+b+c$의 값을 구하라.

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

[40] [1.0점] 함수 f 는 영역 R 의 내부에서 (가) 개의 임계점을 가지며 그 중 극대점은 (나) 개이고 극소점은 (다) 개이다. (가), (나), (다)의 **합**을 구하라.

① 2 ② 3 ③ 4 ④ 5 ⑤ 6

[41] [1.0점] 영역 R 에서 f 의 최댓값을 M, 최솟값을 m이라 할 때, $(M-m)$을 구하라.

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

※ (문제 42 – 45) 아래 글을 읽고 물음에 답하라.

두 무한급수 $\sum_{n=0}^{\infty} a_n$ 과 $\sum_{n=0}^{\infty} b_n$ 의 코시 곱(Cauchy product)은 무한급수 $\sum_{n=0}^{\infty} c_n$ 으로 정의한다.

여기서 $c_n = \sum_{k=0}^{n} a_{n-k}\, b_k$, $n = 0, 1, 2, \cdots$이다. 코시 곱에 대하여 다음 사실이 알려져 있다.

甲. $\sum_{n=0}^{\infty} a_n = A$, $\sum_{n=0}^{\infty} b_n = B$ 이고 둘 중 적어도 하나가 절대 수렴이면, $\sum_{n=0}^{\infty} c_n = AB$ 이다.

乙. 두 멱급수(power series) $\sum_{n=0}^{\infty} a_n x^n$, $\sum_{n=0}^{\infty} b_n x^n$ 의 코시 곱은 $\sum_{n=0}^{\infty} c_n x^n$ 이다. 여기서,

$c_n = \sum_{k=0}^{n} a_{n-k}\, b_k$, $n = 0, 1, 2, \cdots$이다.

이항 정리(binomial theorem)를 일반화하는 이항급수(binomial series)를 주목하자.

$$(1+x)^r = \sum_{n=0}^{\infty} \binom{r}{n} x^n , \ |x| < 1$$

다음은 그 특별한 경우이다.

$$(*) \quad \frac{1}{\sqrt{1+x}} = \sum_{n=0}^{\infty} \gamma_n x^n , \ |x| < 1$$

$$(\#) \quad f(x) := \frac{1}{(1+x)^3} = \sum_{n=0}^{\infty} \omega_n x^n , \ |x| < 1$$

한편, 식 (*)을 제곱하면 다음 식을 얻는다.

$$\frac{1}{1+x} = \sum_{n=0}^{\infty} \xi_n x^n , \ |x| < 1$$

테일러 급수의 유일성을 이용하여 흥미로운 결과를 얻을 수 있다.

[42] [1.1점] 두 무한급수 $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{1+n}}$, $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{1+n}}$ 의 코시 곱 $\sum_{n=0}^{\infty} x_n$ 에 관련한 설명 중 **옳지 않은** 것을 고르라.

① $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{1+n}}$ 은 조건부 수렴(conditionally convergent)이다.

② 甲은 $\sum_{n=0}^{\infty} x_n$ 의 수렴·발산 판정에 직접 적용되지 않는다.

③ $\sum_{n=0}^{\infty} x_n$ 은 절대 수렴(absolutely convergent)이 아니다.

④ $\sum_{n=0}^{\infty} x_n$ 은 조건부 수렴(conditionally convergent)이다.

⑤ $\sum_{n=0}^{\infty} x_n$ 은 발산(divergent)이다.

[43] [1.0점] $f^{(10)}(0)$의 값으로 적절한 것을 고르라.

① $132 \cdot 10! \cdot \xi_{10}$ ② $132 \cdot 10! \cdot \xi_{11}$ ③ $66 \cdot 10! \cdot \xi_{11}$

④ $132 \cdot 10! \cdot \xi_{12}$ ⑤ $66 \cdot 10! \cdot \xi_{12}$

[44] [1.1점] (*)에서 γ_n에 적합한 표현을 고르라.

① $\dfrac{(-1)^n(2n)!}{2^{2n}(n!)^2}$ ② $\dfrac{(2n)!}{2^{2n}(n!)^2}$ ③ $\dfrac{(-1)^n(2n+1)!}{2^{2n+1}(n!)^2}$

④ $\dfrac{(2n+1)!}{2^{2n+1}(n!)^2}$ ⑤ $\dfrac{(2n)!}{2^{2n-1}(n!)^2}$

[45] [1.1점] 지문의 결말로 적절한 식을 고르라.

① $\displaystyle\sum_{k=0}^{n} \frac{(-1)^k(2k)!(2n-2k)!}{(k!)^2((n-k)!)^2} = 2^{2n}$ ② $\displaystyle\sum_{k=0}^{n} \frac{(2k)!(2n-2k)!}{(k!)^2((n-k)!)^2} = 2^{2n}$

③ $\displaystyle\sum_{k=0}^{n} \frac{(-1)^k(2k+1)!(2n-2k)!}{(k!)^2((n-k)!)^2} = 2^{2n+1}$ ④ $\displaystyle\sum_{k=0}^{n} \frac{(2k+1)!(2n-2k)!}{(k!)^2((n-k)!)^2} = 2^{2n+1}$

⑤ $\displaystyle\sum_{k=0}^{n} \frac{(2k+1)!(2n-2k)!}{(k!)^2((n-k)!)^2} = 2^{2n+2}$

※ 문제 46 - 47

평면 상의 아래 곡선을 생각하자.

$$x^2 + y^2 = \sqrt{x^2 + y^2} + x$$

물음에 답하라.

[46] [1.0점] 곡선 상의 점 $\left(\frac{1}{\sqrt{2}} + \frac{1}{2}, \frac{1}{\sqrt{2}} + \frac{1}{2}\right)$에서의 접선의 기울기를 구하라.

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

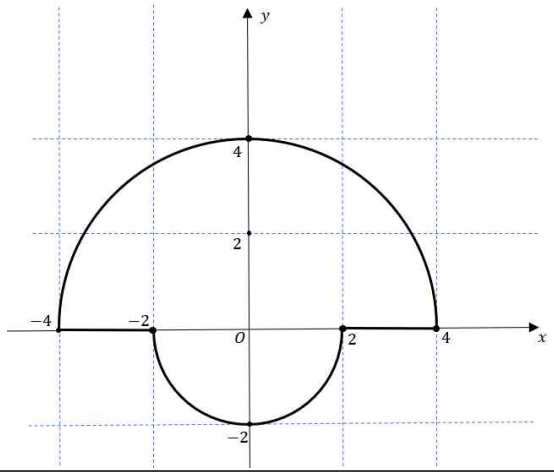
④ $-\dfrac{1}{1+\sqrt{2}}$ ⑤ $-\dfrac{1}{1+\sqrt{3}}$

[47] [1.0점] 이 곡선의 제 1사분면(the first quadrant)에 해당되는 부분의 길이(arc length)를 구하라.

① $2\sqrt{2}$ ② $2\sqrt{3}$ ③ 4 ④ $2(\sqrt{2}+1)$ ⑤ 8

※ 문제 48 - 50

중심이 원점이고 반지름이 2인 원을 시계 반대 방향으로 회전하는 곡선을 C_1이라 하자. 오른쪽 그림에서와 같이 두 개의 반원과 두 개의 선분으로 이루어진 단일폐곡선을 C_2라 하고, 곡선 C_2로 둘러싸인 영역을 R이라 하자. 물음에 답하라.



[48] [1.1점] <**아래**> 선적분을 구하라.

< 아래 >

$$\int_{C_1} \frac{(x^2-y^2)\,dx + 2xy\,dy}{(x^2+y^2)^2}$$

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

[49] [1.1점] <**아래**> 선적분을 구하라. 단, 곡선 C_2의 방향은 시계 반대 방향이다.

< 아래 >

$$\int_{C_2} \frac{\left((x^2-y^2)-y(x^2+y^2)+y(x^2+y^2)^2\right)dx + \left(2xy+x(x^2+y^2)\right)dy}{(x^2+y^2)^2}$$

① 10π ② -10π ③ 8π ④ -8π ⑤ 12π

[50] [1.1점] 영역 R 모양의 얇은 판(lamina)을 생각하자. R의 각 점에서의 밀도가 원점으로부터의 거리에 비례한다고 할 때 R의 무게중심(centroid)의 y-좌표를 구하라.

① 1 ② $\frac{56\pi}{15}$ ③ $\frac{56}{15\pi}$ ④ $\frac{\pi}{5}$ ⑤ $\frac{5}{\pi}$