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

단국대학교 2023학년도 편입생 모집 필기고사

고사시간	오전
과 목	영어, 수학

자연계열 문제지

지원학부(과)	
수험번호	
성 명	

영어 [자연계열] < 오전 >

※ 밑줄 친 부분과 뜻이 가장 가까운 것을 고르시오. (1-8) **[각 3점]**

1. Party members had been <u>feuding</u> over his proposed legislation, and leaders believed only the President could rally them together.
① concurring ② disputing ③ settling ④ hesitating

2. The balance of evidence suggests a <u>discernible</u> human influence on global climate.
① perceptible ② ignorable ③ salable ④ intangible

3. Every day at meal-times you go out, <u>apparently</u> to a restaurant, and loaf an hour in the Luxembourg Gardens, watching the pigeons.
① ostensibly ② irreversibly ③ utterly ④ impassably

4. Beneath the <u>adulation</u>, Kim was still a teenager living with her parents, struggling with the constraints of sudden celebrity and the post-Olympic depression common to elite athletes.
① arrogance ② self-esteem ③ disdain ④ overpraise

5. Those two weeks are a clinically <u>quiescent</u> period for the person within whom the seeds of malaria are undergoing repeated division.
① awesome ② necessary ③ quiet ④ sagacious

6. After the celebrity was involved in a scandal, the cosmetic company <u>rescinded</u> its offer of an endorsement contract.
① renewed ② revoked ③ rectified ④ redrafted

7. When Adar, then just 21, joined the company in 2001, he persuaded his father to dramatically ramp up production—<u>wagering</u> that they could fill a gap in global supply by making low-cost vaccines in very large quantities.
① betting ② contradicting ③ worrying ④ complaining

8. The wrestler was not very big, but his skill and speed made him a <u>formidable</u> opponent.
① malevolent ② insolent ③ lecherous ④ daunting

※ 어법상 빈칸에 가장 적절한 것을 고르시오. (9-11) **[각 3점]**

9. Students who respect themselves and their work _____ to copy from anyone.

① will certainly tempt ② certainly not will be tempted
③ will certainly not be tempted ④ will be certainly tempted

10. _____ the way of harnessing the water power of the river, he would have advanced his living level there in the mountain.

① If he knew ② Had he known
③ Knowing ④ Has he known

11. _____ on the arm, the device measures each user's heart rate, core body temperature and exertion, pinging a cloud-based platform to alert commanders and colleagues when those measures hit unsafe levels.

① Had been worn ② Wearing
③ Worn ④ Having worn

※ 밑줄 친 부분 중 어법에 맞지 않은 것을 고르시오. (12-14) **[각 3점]**

12. Not only ①they have the expertise to answer medical questions and ②clear up misperceptions, ③but they can relate to the people they encounter on social media as fellow parents who also want ④what's best for their families and communities.

13. In a nation ①whose education system, considered by many ②to be the best in the world, ③rests heavily on experiential learning, the solutions-based approach of studying circular economy ④adapt to all levels of formal education.

14. Fortunately, a ①flourishing literature on Native Americans in recent years ②demonstrates not only the ③vitality of this field but ④their relevance to American culture in general.

※ 다음 글을 읽고 물음에 답하시오. (15-16) **[각 3점]**

The terrible man-made famine of 1974, which by some estimates killed 1.5 million Bangladeshis, changed Yunus' life forever. "While people were dying of hunger on the streets, I was teaching elegant theories of economics as a professor. I started hating myself for the arrogance of pretending I had answers. Why did people who worked 12

hours a day, seven days a week, not have enough food to eat? I decided that the poor themselves would be my teachers. I began to study them and question them on their lives."

Then he made his big discovery. One day, when he was interviewing a woman who made bamboo stools, he learned that, because she had no capital of her own, she had to borrow the equivalent of 23 cents to buy raw bamboo for each stool made. After repaying the middleman, she kept only 1.5 cents in profit. With the help of graduate student, Yunus discovered that there were 42 other villagers facing the same predicament.

"Their poverty was not a personal problem due to laziness or lack of intelligence, but a _____ one: lack of capital. The existing system made it certain that the poor could not save a penny and could not invest in bettering themselves."

Yunus excluded the borrowers who are not destitute and so, usually, men. Yunus soon discovered that lending to women was much more beneficial to whole families—and that women were more careful about their debts. To be eligible for a loan, a person must prove she understands how the Grameen Bank works. Borrowers pledge [promise] to abide by "the 16 decision," a set of personal commitments. The most important is to join with four fellow borrowers, none of whom can be a family member, to form a "group." The group provides a borrower with self-discipline and courage. Peer pressure and peer support effectively replace collateral.

15. Which is the most appropriate for the blank?

① psychological ② structural ③ diplomatic ④ relative

16. According to the passage, which is NOT true?

① Women were more cautious to their debts than men.
② Men were not usually allowed to get a loan from the Grameen Bank.
③ Yunus had much interest in practical economy for the poor.
④ Yunus was eager for increasing the profits of his graduate students.

※ 다음 글을 읽고 물음에 답하시오. (17-18) **[각 3점]**

Gravitational lensing is a process in which light is bent by high-mass objects along its path. Think of a beam of light as a bullet travelling at 186,282 miles per second. At least, that would be the bullet's speed in a vacuum, and in a vacuum it would also travel in a perfectly straight line. But if we place our bullet in a crowded space—such

as our solar system, which is far from empty—we complicate things. Even if the bullet stays far away from planets and their moons as it travels through space, it will be _____ affected by them. Imagine that the bullet is shot from the Sun at its full velocity, just as a beam of light would be. As it passes the tiny planet Mercury, it feels a slight pull—not much, but enough to bend its path a little. Yet it carries on, and as it passes the somewhat larger planets Venus, Earth, and Mars, it feels slightly stronger tugs, each of which pulls it ever so slightly off its original trajectory. In fact, if we had a chart that showed its original projected path as it was shot from the Sun, and we charted where the bullet was as it passed Mars, we would notice that it was actually no longer on that original straight path. Then, as the bullet approaches the giant planet Jupiter, gravitational forces really come into play.

17. Which is the most appropriate for the blank?

① never ② strongly ③ randomly ④ subtly

18. According to the passage, which is true?

① A bullet can travel in a perfectly straight line if it is shot from the Sun.
② The path of a beam of light is affected by gravitational forces in a crowded system.
③ Even in a vacuum, gravitational forces influence the path of a beam of light.
④ Light would not be affected by the size of objects it passes in space.

※ 다음 글을 읽고 물음에 답하시오. (19-20) **[각 3점]**

Antarctica is the most isolated place on earth. Every year, scientists from all over the world travel there to work in conditions of extreme cold, with temperatures reaching minus 100 degrees Fahrenheit. In addition to being cold, the atmosphere is extremely dry and windy. Between February and October each year it gets so cold that parts of the continent are inaccessible. Around the middle of the continent, near the South Pole Station, the cold weather causes plane fuel to change consistency, making it impossible for aircraft to land. Thus, between Feburary and October, the team of researchers at the station must live together in (A)_____.

Numerous research stations exist on Antarctica, and staff may need medical treatment for anything from a cold to a bad cut. The extreme cold, wind, and dryness of the Antarctic environment can also cause many ailments. Hence, at each of the research stations, a doctor must be on call twenty-four hours a day, seven days a week. When Jerri Nielson saw an ad in a medical journal for doctors to work at the U.S. Antarctic

research base, she was interested and decided to go.

Jerri had previously practiced emergency medicine only in the sterile confines of a hospital. For the next few months, she experienced a totally different working environment. She discovered that the weather played havoc with conventional treatments —adhesive bandages would not stick, and wounds took longer to heal. As a result, Jerri found it necessary to improvise and think of new ways to care for her patients. She also found herself looking at relationships with her patients in a new light. She was the only doctor to a group of forty people, and unlike in the U.S., her patients became her (B)_____.

19. Which is the most appropriate for the blank (A) and (B)?

① isolation — friends
② harmony — enemies
③ cooperation — co-workers
④ conflict — targets

20. According to the passage, which is true?

① Between Feburary and October, warmer weather makes the South Pole Station accessible by aircraft.
② In Antarctica, wounds heal more quickly than they do in warmer countries.
③ In the U.S. Antarctic research station, a doctor should be on duty at all times.
④ Prior to working in Antarctica, Jerri worked as an emergency nurse.

※ 다음 글을 읽고 물음에 답하시오. (21-22) **[각 3점]**

Empathy is more than anything a state of mind, a different way of relating to others. The greatest danger you face is your general assumption that you really understand people and that you can quickly judge and categorize them. (A)_____, you must begin with the assumption that you are ignorant and that you have natural biases that will make you judge people incorrectly. The people around you present a mask that suits their purposes. You mistake the mask for reality. Let go of your tendency to make snap judgments. Open your mind to seeing people in a new light. Do not assume that you are similar or that they share your values. Each person you meet is like an undiscovered country, with a very particular psychological chemistry that you will carefully explore. You are more than ready to be surprised by what you uncover. This flexible, open spirit is similar to creative energy—a willingness to consider more possibilities and options. (B)_____, developing your empathy will also improve your creative powers.

The best place to begin this transformation in your attitude is in your numerous daily conversations. Try reversing your normal impulse to talk and give your opinion, desiring instead to hear the other person's point of view. You have tremendous curiosity in this direction. Cut off your incessant interior monologue as best you can. Give full attention to the other. What matters here is the quality of your listening, so that in the course of the conversation you can mirror back to the other person things they said, or things that were left unsaid but that you sensed. This will have a tremendous seductive effect.

21. Which is the most appropriate for the blanks (A) and (B)?

① Therefore — Nonetheless
② However — Nonetheless
③ Instead — In fact
④ In other words — However

22. According to the passage, which is true?

① You tend to mistake others' appearances for reality.
② You can develop your empathy by sharing your own values with others.
③ To judge and categorize people correctly, you need to give your opinion to others.
④ The greatest danger you face is that you do not participate in daily conversations.

※ 다음 글을 읽고 물음에 답하시오. (23-25) **[각 3점]**

So what does help when a friend or family member is in the thick of caregiving, or any crisis? First, offer space for the full range of their emotions, on their terms. There's immense power in a simple text telling a friend you're there for them, particularly if you add this magic phrase at the end: "No need to respond."

When I was overwhelmed, keeping up with communications was tough, and I appreciated friends who explicitly took the pressure off. I knew they saw and could handle my real experience: often harried, sometimes far from positive.

When it comes to practical assistance, try to offer specific help that the caregiver doesn't have to ask for. However kindly meant, "What can I do?" puts the onus back on your overwhelmed friend to come up with a suitable task, increasing their mental load.

I still tear up thinking of the matter-of-fact generosity extending by the parents of our then 6-year-old's best friend. They made a standing offer to take our daughter every Sunday, and for almost a year, we dropped her off weekly, no questions asked, for a fun day with their daughter—and a needed break from the caregiving sandwich for me.

_____, I'll always be grateful to the friend who asked to set up the "meal

train" that kept us fed for more than a year, and the many people who signed up for it. If you're far from someone you want to support, gift certificates for meal delivery and errand or laundry services are perfect.

23. Which is the most appropriate for the blank?

① Originally ② Likewise ③ In contrast ④ Fortunately

24. Which underlined part is NOT appropriate in the context?

① telling ② meant ③ increasing ④ extending

25. According to the passage, which is NOT one of the advice helping caregivers?

① A simple text message can help caregivers.
② Practical or specific assistance can be helpful.
③ A careless offer can hurt caregivers' feeling.
④ Gift certificates can be a method of helping caregivers.

※ 다음 글을 읽고 물음에 답하시오. (26-28) **[각 5점]**

In order to talk about the different artistic styles that have existed over time, art historians have classified these styles into different periods and organized them in chronological order. The works of art produced within each period (A)_____ the culture and event of that time.

The earliest forms of art, from the Prehistoric era, include simple cave paintings and figures made from stone. These were followed by the sculpture and carvings of the Ancient Civilizations era. Styles of the later Classical era (800 B.C. to 200 A.D.) reflect the culture of the time—one that favored simplicity and balance. The period of the Middle Ages followed, and succeeded by a revival of classical styles in the Renaissance era, beginning around 1400. Well-known artists of this time included Michelangelo and da Vinci. One hundred years of Baroque style, and then fifty years of Rococo followed the 200-year Renaissance. The start of the nineteenth century saw the rise of the Premodern era, followed by the Modern era, a period that lasted until 1945. This was followed by the Postmodern era that characterizes the present day.

In addition to differences in artistic styles *between* eras, there are also differences in *within* each era. The Postmodern era, for example, has featured innovative artistic style such as Pop Art, Minimalism, and Conceptualism. Since the 1960s, Conceptualism has grown in popularity. This style (B)_____ more on the idea or 'concept' of art

using realistic objects, rather than on art that is created using traditional materials such as paint, canvas, stone, or clay. Whereas Andy Warhol used a can of beans as the basis for a painting, for example, a conceptual artist might say that (C)_____.

26. Which is the most appropriate for the blank (A) and (B)?

① draw — imagines
② show — creates
③ mirror — focuses
④ depict — constructs

27. Which is best fit for the blank (C) to complete the passage?

① the can is only for Andy Warhol
② the can is never an artistic object
③ the can is an artistic material for painting
④ the can itself is a work of art

28. According to the passage, which is true?

① Baroque and Rococo era came after the Renaissance era that lasted for two hundred years.
② The Prehistoric ages have many artistic styles represented in the sculpture and carvings.
③ The Postmodern era covers the present days and there has been no traditional artistic style since 1960s.
④ The Renaissance era was a revival of classic favoring Rococo style.

※ 다음 글을 읽고 물음에 답하시오. (29-30) **[각 5점]**

I'm different. I'm more rational than others, more ethical as well. Few would say this to people in conversation. It sounds arrogant. But in numerous opinion polls and studies, when asked to compare themselves with others, people generally express a variation of this. It's the equivalent of an optical illusion—we cannot seem to see our faults and irrationalities, only those of others. So, (A)_____, we'll easily believe that those in the other political party do not come to their opinions based on rational principles, but those on our side have done so. On the ethical front, few of us will ever admit that we have resorted to deception or manipulation in our work or have been clever and strategic in our career advancement. Everything we've got, or so we think, comes from natural talent and hard work. But with other people, we are quick to ascribe to them all kinds of Machiavellian tactics. This allows us to justify whatever we do, no matter the

results. We feel a tremendous pull to imagine ourselves as rational, decent, and ethical. These are qualities highly promoted in the culture. To show signs otherwise is to risk great disapproval. If all of this were true—if people were rational and morally superior—the world would be suffused with goodness and peace. We know, (B)_____, the reality, and so some people, perhaps all of us, are merely deceiving ourselves. Rationality and ethical qualities must be achieved through awareness and effort. They do not come naturally. They come through a maturation process.

29. Which is the most appropriate for the blanks (A) and (B)?

① accordingly — for example
② in other words — therefore
③ for instance — however
④ consequently — eventually

30. According to the passage, which is true?

① People are able to acquire ethical qualities through manipulation.
② People have a tendency to see others' faults easily rather than their own ones.
③ People seem to be rational and ethical only in their reality.
④ People are likely to admit their faults particularly on ethical issues.

수학 [자연계열] <오전> [문항별 5점]

31. 함수

$$f(x)=\begin{cases}2-x, & (x<-1)\\ x, & (-1\le x<1)\\ 0, & (x=1)\\ (x-1)^2+1, & (1<x<2)\\ e^{-x+2}+1, & (x>2)\end{cases}$$

이라 하자. $\lim_{x\to a} f(x)$가 존재하지 않는 a의 개수를 A, 함수 $f(x)$가 $x=b$에서 불연속인 점 b의 개수를 B라 할 때, $A+B$의 값은?

① 3 ② 4 ③ 5 ④ 6

32. $f(x)=x+e^x$일 때, $f(0)=1$이다. $(f^{-1})'(1)$의 값은?

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

33. $\int_{-\infty}^{\infty} x^2 e^{-x^2} dx$의 값은?

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

34. 함수 $f(x)=x^2-\frac{1}{8}\ln x$의 그래프 위의 두 점 $(1,f(1))$과 $(e^4,f(e^4))$ 사이의 곡선의 길이는?

① $e^4-\frac{1}{2}$ ② $e^4+\frac{1}{2}$ ③ $e^8-\frac{1}{2}$ ④ $e^8+\frac{1}{2}$

35. 다음 중 옳은 것을 있는 대로 모두 고른 것은?

㉠ 급수 $\sum_{n=1}^{\infty}\frac{1}{n\sqrt{n^2+3}}$은 수렴한다.

㉡ 급수 $\sum_{n=4}^{\infty}(-1)^{n+1}\sin\frac{\pi}{\sqrt{n}}$는 발산한다.

㉢ 멱급수 $\sum_{n=1}^{\infty}\frac{(-1)^n}{2^n}(x+1)^n$이 수렴하게 되는 정수 x의 개수는 4이다.

① ㉠ ② ㉠, ㉡
③ ㉠, ㉢ ④ ㉡, ㉢

36. 극 곡선 $r=1+\sin\theta$에 대하여 $\theta=\frac{\pi}{4}$일 때의 접선의 기울기는?

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

37. 두 점 $(2,4,-3),(3,-7,-17)$을 지나는 직선이 xy 평면과 만나는 점을 $(a,b,0)$이라 할 때, $4a-b$의 값은? (단, a,b는 상수)

① $-\frac{25}{14}$ ② $-\frac{11}{14}$ ③ $\frac{11}{14}$ ④ $\frac{25}{14}$

38. 점 $(1,-2,0)$에서 벡터 $\vec{v}=\langle 2,1,-2\rangle$ 방향으로의 함수 $f(x,y,z)=x^2y-yz^3+z$에 대한 방향도함수의 값은?

① -6 ② -5 ③ -4 ④ -3

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39. 연속함수 $f(x)$가 모든 자연수 n에 대하여

$$\int_0^n f(t)\,dt = \frac{4}{n}$$

를 만족시킬 때,

$$\int_0^{\sqrt{n}} \int_x^{\sqrt{n}} f(y^2)\,dy\,dx > \frac{1}{2}$$

을 만족시키는 자연수 n의 개수는?

① 1 ② 2 ③ 3 ④ 4

40. 영역 E는 네 점 $(1,1),(1,-1),(-1,1),(-1,-1)$을 꼭짓점으로 하는 정사각형의 내부와 경계로 이루어진 영역이다. E에서 정의된 이변수함수

$$f(x,y) = x^2 + y^2 - x^2y + 4$$

에 대한 다음 설명 중 옳은 것의 개수는?

㉠ f는 점 $(0,0)$에서 극솟값을 갖는다.
㉡ $\nabla f\left(\frac{1}{2},\frac{1}{2}\right) = \vec{0}$
㉢ f의 최댓값은 7이다.
㉣ f의 최솟값은 $\frac{13}{4}$이다.

① 1 ② 2 ③ 3 ④ 4

41. 네 직선

$$y = -2x + 4,\quad y = -2x + 7,$$
$$y = x - 2,\quad y = x + 1$$

로 둘러싸인 영역을 D라 하자. 이중적분

$$\iint_D (6x^2 - 3xy - 3y^2)e^{3x}\,dA$$

의 값은?

① $6e^9 - 12e^6 - 4e^3$ ② $6e^9 + 12e^6 - 4e^3$
③ $6e^9 - 9e^6 - 6e^3$ ④ $6e^9 + 9e^6 - 6e^3$

42. 곡면 $S = \{(x,y,z) \mid x^2 + y^2 + z^2 = a^2,\ z > 0\}$ 위에서 정의된 벡터장

$$\vec{F}(x,y,z) = \langle x + y,\ z^2,\ x^2 \rangle$$

에 대하여 면적분이 $\iint_S \vec{F} \cdot d\vec{S} = \frac{a^2}{12}\pi$일 때,

$\frac{1}{a} - 3a$의 값은? (단, a는 양의 실수이고, 곡면 S의 방향은 점 $(0,0,a)$에서 $\vec{k} = \langle 0,0,1 \rangle$ 방향)

① 8 ② 10 ③ 12 ④ 14

43. 곡선 C_1, C_2와 C는 다음과 같다.

(1) 곡선 C_1은 시점 $(0,0)$에서 종점 $(\pi,1)$까지 곡선 $y = \sin\frac{x}{2}$
(2) 곡선 C_2는 시점 $(\pi,1)$에서 종점 $(2\pi,0)$까지 곡선 $y = \frac{1}{\pi^2}(x - 2\pi)^2$
(3) $C = C_1 \cup C_2$

벡터장 $\vec{F}(x,y) = \langle 3 + 2xy,\ x^2 - 3y^2 + \tan y^2 \rangle$에 대하여, 선적분 $\int_C \vec{F} \cdot d\vec{r}$의 값은?

① -6π ② -3π ③ 3π ④ 6π

44. 다음 중 옳지 <u>않은</u> 것의 개수는?

㉠ 매개방정식

$$\begin{cases} x = 2\tan\theta \\ y = 3\sec\theta \end{cases} \quad \left(-\frac{\pi}{2} < \theta < \frac{\pi}{2}\right)$$

은 타원의 일부분을 나타낸다.
㉡ 곡선 $\vec{r}(t)$에 대해서 $|\vec{r}(t)| = 1$이면 $\vec{r}(t)$와 $\vec{r}\,'(t)$는 직교한다.
㉢ $|\vec{u} \times \vec{v}|^2 = |\vec{u}|^2 |\vec{v}|^2 - (\vec{u} \cdot \vec{v})^2$
㉣ $\operatorname{div}(\operatorname{curl} \vec{F}) = 0$

① 1 ② 2 ③ 3 ④ 4

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45. $A=\begin{pmatrix} a & 1 & 0 \\ -1 & b & 0 \\ c & 2 & d \end{pmatrix}$의 고윳값이 $\lambda=-1,1,2$일 때, 행렬 A^2-2I의 행렬식의 값은?
(단, I는 단위행렬이고, a, b, c, d는 실수)

① 1 ② 2 ③ 3 ④ 4

46. 선형변환 $T:\mathbb{R}^3\to\mathbb{R}^2$가 다음을 만족시킨다.

$T(\langle 1,0,0\rangle)=\langle 1,3\rangle$
$T(\langle 1,1,0\rangle)=\langle 2,2\rangle$
$T(\langle 1,1,2\rangle)=\langle 6,10\rangle$

$\mathbb{R}^3$의 기저 $\beta_1=\{\langle 1,0,0\rangle,\langle 1,1,0\rangle,\langle 1,1,2\rangle\}$와 $\mathbb{R}^2$의 기저 $\beta_2=\{\langle 1,3\rangle,\langle 2,2\rangle\}$에 대한 선형변환 T의 행렬표현(matrix for T relative to the bases β_1 and β_2)은?

① $\begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 3 \end{pmatrix}$ ② $\begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 2 & 2 \end{pmatrix}$
③ $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 3 \end{pmatrix}$ ④ $\begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \end{pmatrix}$

47. $\begin{pmatrix} 1 & 0 & 0 \\ 2 & a^2 & 4 \\ 3 & 0 & 2a \end{pmatrix}$의 특성방정식(characteristic equation)이 $\lambda^3-9\lambda^2+24\lambda-8a=0$일 때, 실수 a의 값은?

① 1 ② 2 ③ 3 ④ 4

48. 미분가능한 함수 $f(x)$와 $g(x)=x$의 Wronskian이 $W(f,g)(x)=-3x^4$이다. $f(-1)=0$일 때, $f(1)$의 값은?

① 1 ② 2 ③ 3 ④ 4

49. 미분방정식

$$x^2y''+xy'+y=\sec(\ln x), y(1)=3,\ y(e^{\frac{\pi}{2}})=\frac{3}{2}\pi$$

의 해를 $f(x)$라 할 때, $\sum_{j=1}^{2023} f(e^{2j\pi})$의 값은?

① 6069 ② 2023π
③ 12138 ④ 4046π

50. 함수

$$g(t)=\int_0^t\int_0^u e^{-\tau}\sinh(2\tau)\cos(u-\tau)\,d\tau du$$

의 라플라스 변환은?

① $\dfrac{2}{(s-1)(s+3)(s^2-1)}$
② $\dfrac{2}{(s-1)(s+3)(s^2+1)}$
③ $\dfrac{2s}{(s-1)(s+3)(s^2-1)}$
④ $\dfrac{2s}{(s-1)(s+3)(s^2+1)}$

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