2021학년도
아주대학교 편입학 수강능력시험

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

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1. (0.8 points) The likes, comments, and posts we share on social media can often seem _____ but they matter. They tap into some of the very elements that make us human, our addictions, desires, anxieties, and joys.

① illegible
② imperative
③ inconsequential
④ intrusive
⑤ irrational

2. (0.8 points) According to Campbell, the hero's story begins with the "call to adventure" that pulls him from his _____ life. "The familiar life horizon has been outgrown; the old concepts, ideals, and emotional patterns no longer fit; the time for the passing of a threshold is at hand."

① accustomed
② exotic
③ extreme
④ indulgent
⑤ solitary

3. (0.8 points) If you've ever stayed in a relationship too long or stuck with a project that was going nowhere, you're not alone. Humans are generally _____ to give up on something they've already committed time and effort to. It's called the "sunk costs" phenomenon, where the more resources we sink into an endeavor, the likelier we are to continue— even if we sense it's futile.

① prone
② reluctant
③ subject
④ supposed
⑤ wired

Questions 4-5: Choose the underlined word or phrase that must be changed for the sentence to be correct.

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4. (1.0 points) Most taxes ①designing to raise revenue have a distorting effect on incentives, especially on people's willingness to work. ②Just as a tax on cigarettes reduces the amount of smoking, an income tax reduces the amount of work people do in the formal sector. My next-door neighbor chose not to work, and instead to stay home and take care of his kids, because his wife's income ③put him in a high income bracket. ④Had he worked and hired a baby-sitter, he would have had to pay taxes on his income and on his baby-sitter's income. By staying at home, he ⑤enjoyed tax-free baby-sitting.

5. (1.0 points) Remaking California's Central Valley wetlands was a complicated project ①that took much of the 20th century. ②Resurrected from degraded farmland and cash-strapped gun clubs, assembled by bulldozer and backhoe, the current patchwork of national wildlife refuges, state wildlife areas, and county preserves ③are much diminished from the four million acres of primeval wetlands that spanned the Central Valley ④before it was farmed. Nevertheless, these habitats are ecologically significant on a hemispheric level, ⑤serving 60 percent of migratory waterfowl on the Pacific Flyway, including three million ducks and two million geese.

Questions 6-7: Choose the expression that best completes the sentence.

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6. (1.0 points) A pack of hyena can catch prey _____ bring down that it pays each selfish individual to hunt in a pack, even though this involves sharing food.

① so larger much than a lone hyena can
② much so larger than can a lone hyena
③ so much larger than can a lone hyena
④ so much larger than a lone hyena can
⑤ much so larger than a lone hyena can

7. (1.0 points) Underneath the stone _____ where each layer had several items placed on it to serve as offerings to the gods.

① was a multilayered chamber founded
② a multilayered chamber has found
③ were found a multilayered chamber
④ a multilayered chamber has founded
⑤ was found a multilayered chamber

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) Weather data flow through neural nets and populate massive data centers, but they also reside in refrigerators and polystyrene tubes. And the climate archive (like most archives) gets wilder and dirtier the deeper you go. To survey the past 150 years or so, climate researchers can use instrument readings from ships and weather stations, but to understand global patterns across deep time, they must turn to proxies: ice cores, boreholes, lake and ocean sediments, pollens, corals, and other natural features that index climatic events. The geologic field itself, and strategically selected samples of it, become archival documents, in the same way that the photographs of stars, the stones in a museum of mineralogy, and the animals that are catalogued and shown in a zoo are documents.

(a) Weather data can be collected from laboratory equipment.
(b) Proxies for climate data include instrument readings from ships in the ocean.
(c) A deeper investigation of the climate archive will reveal the negative aspects of it.
(d) The way geologic samples are documented can contrast with the way the pictures of stars are archived.

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

9. (1.1 points) According to evolution totalitarians, I love my wife because I want to propagate my genes and attain an exemplary mother for my children. That may or may not be entirely true, but it doesn't diminish the fact that I love my wife. Correspondingly, my dog's genes may tell him to love me because I bring home the Alpo, but that doesn't mean that he doesn't love me. Once that bond is established, who really cares what its genetic basis is? Everything wonderful about dogs stems not from the why of their affection, but from the fact of their affection.

(a) Evolution totalitarians see that our affection for another comes from selfish motives.
(b) The genetic basis of affection or care for others has not been scientifically proven.
(c) Dogs' affection for human beings is from natural motives.
(d) Dogs build emotional bonds with human beings.

① (a) & (b)
② (b) & (c)
③ (b) & (d)
④ (a), (b) & (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] At the Institute of Geosciences at Johannes Gutenberg University Mainz (JGU), Dr. Michael Deininger investigated (a) how regional climate systems have changed since the beginning of the current interglacial period some 10,000 years ago and what conclusions can be drawn from this. ❶ "We were able to accurately reconstruct summer precipitation in the monsoon regions in Africa and South America, compare this data with changes in precipitation in the northern mid-latitudes, and relate this to changes in temperature," Deininger explained. The study also involved scientists from Australia, Brazil, Mexico, Ireland, Austria, and South Africa. ❷

[B] As (b) the Earth is heated stronger at the equator than at the poles due to the differing distribution of solar radiation, a temperature gradient develops which, to put it in simple terms, causes atmospheric circulation to transport energy toward the poles. ❸ Changes to this solar radiation-related temperature difference will in turn influence the atmospheric circulation, and thus, also regional precipitation patterns.

[C] The new study shows that over the past 10,000 years, changes to regional precipitation in the northern latitudes, Africa, and South America have more or less been synchronous. ❹ "We argue that these regional climate variations are connected and that they are mainly caused by alterations to solar radiation and the associated temperature differences between the tropics and polar regions," stated Deininger.

[D] The researchers involved in the study (c) were particularly interested in the question of whether it is possible to learn from the past to benefit the future. With the current level of global warming, the temperature gradient between the equator and the poles is being reduced— especially due to the fact that warming in the Arctic has a particularly marked effect. ❺ This can weaken the westerly winds in mid-latitudes in the Northern Hemisphere, cause a weaker South American monsoon and a stronger African monsoon, while at the same time lead to lower precipitation levels in the summer rainfall zone of Southeast Africa. The consequences of this could be shifts in regional rainfall patterns, (d) potentially caused droughts in some areas, and flooding in others. "In the future, we need to recognize (e) the fundamental role the variation in temperature difference plays in controlling our climate system," concluded Dr. Deininger.

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

① Arctic Warming Contributing to Drought
② The Arctic Heated Up Three Times More Than Planet Average
③ A Reconstruction of Global Average Surface Temperature Change
④ The Differences in Temperature Between the Tropics and the Poles
⑤ Change in Global Precipitation Patterns as a Result of Climate Change

11. (1.0 points) Choose the underlined phrase that must be changed for the sentence to be grammatically correct.

① (a) how regional climate systems have changed
② (b) the Earth is heated stronger
③ (c) were particularly interested in the question
④ (d) potentially caused droughts
⑤ (e) the fundamental role the variation in temperature difference plays

12. (1.0 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?

To do this, the paleoclimatologist looked at data for rainfall time series recorded in various climate archives.

① ❶ ② ❷ ③ ❸ ④ ❹ ⑤ ❺

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

① The researchers are interested in what we can learn from the past to benefit the future.
② Dr. Michael Deininger teamed up with scholars from other countries to conduct the research.
③ The research team succeeded in reconstructing summer precipitation in African and South American monsoon areas.
④ The study revealed that changes to regional precipitation in the researched regions took place sequentially.
⑤ Temperature rise in the Arctic has an extremely noticeable influence.

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

[A] Meritocracy is a difficult principle to sustain in a democracy. Any system that allocates rewards on the basis of merit inevitably gives higher compensation to the few, leaving the majority of people potentially envious. In a democracy, the majority generally rules. Why should that majority agree to grant a minority disproportionate power and rewards?

[B] A little more than a decade ago this dynamic played out neatly at the University of Chicago, an institution that still attracts market-oriented people, thanks to its association with the great free-market economist Milton Friedman. Who could be more promarket and promeritocracy than Master in Business Administration (MBA) students who attend such a school, investing tens of thousands of dollars and two years of their lives to (a) reap the rewards of a meritocratic system? Nevertheless, in a move that contradicted the meritocratic spirit, University of Chicago MBA students voted in 2000 not to reveal their grades to recruiters. The reason was clear: allowing recruiters to distinguish among them on the basis of merit would benefit a minority of them at the expense of a majority. Even the most meritocratic people, then, can vote against meritocracy when it damages their own prospects. No wonder meritocracy is so politically fragile.

[C] Nevertheless, two factors help sustain a meritocratic system in the face of this challenge: (i) a culture that considers it (b) legitimate to reward effort with higher compensation and (ii) benefit large enough, and spread widely enough through the system, to counter popular discontent with inequality. The cultural factor is easy to spot in America, which encouraged meritocracy from its inception. In the 18th century, the social order throughout the world was based on birthrights: nobles ruled Europe and Japan and the caste system prevailed in India. The American Revolution was a revolt against aristocracy and the immobility of European society, but unlike the French Revolution, which emphasized the principle of equality, it championed the freedom to pursue happiness. In other words, (1) _____. The subsequent economic success of the new country (c) cemented the belief in assigning rewards and responsibilities according to merit.

[D] This historical heritage (d) is reflected in American attitudes today. The income-inequality gap in America is among the largest in the developed world. Yet in a recent survey of 27 developed countries, only one-third of Americans agreed that it was the government's responsibility to reduce income inequality. Americans do not want to redistribute income, but they do want the government to provide a (e) level playing field: more than 70 percent of Americans said that the role of government was "to ensure everyone has a fair chance of improving their economic standing."

14. (1.1 points) Which of the following would be the best title for the above passage?

① The Benefits of American Meritocracy
② The Traditional View of a Meritocracy
③ The Concise History of Modern Meritocracy
④ The Tension Between a Democracy and a Meritocracy
⑤ The Politicization of a Meritocracy in American Contexts

15. (1.1 points) Which of the following would best fit in blank (1) in paragraph [C]?

① in France, the legitimacy of rewarding hard work is extremely pervasive.
② America was founded on equality of opportunities, not on equality of outcomes.
③ the belief in equality of opportunity is supported by another belief that the system is actually fair.
④ a meritocratic system, to engender a broad consensus, must confer benefits that are relatively sizable.
⑤ meritocratic systems emerged when their potential benefits are the most acutely felt in the United States of America.

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

① (a) reap the rewards, get out what one puts in
② (b) legitimate, legal
③ (c) cemented the belief, strengthened the belief
④ (d) is reflected, is shown
⑤ (e) level playing field, situation in which everyone has the same opportunities

17. (1.1 points) According to the passage, which of the following is NOT true?

① The French Revolution and the American Revolution shared a common goal of achieving the liberty to pursue equal opportunities.
② In a meritocracy, the few tend to receive higher compensation than the majority.
③ The majority of Americans believe that the government is not responsible for minimizing income inequality, according to a recent survey.
④ America has fostered meritocratic beliefs from its inception as opposed to most other countries.
⑤ The vote conducted at the University of Chicago MBA school in 2000 proved the political fragility of meritocracy.

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

[A] What did you think of the last commercial you watched? Was it funny? Confusing? Would you buy the product? You might not remember or know for certain how you felt, but increasingly, machines do. New artificial intelligence technologies are learning and recognizing human emotions, and using that knowledge to improve everything from marketing campaigns to healthcare.

[B] These technologies are referred to as "emotion AI." Emotion AI is a subset of artificial intelligence (the broad term for machines replicating the way humans think) that measures, understands, simulates, and reacts to human emotions. It's also known as affective computing or artificial emotional intelligence. The field dates back to at least 1995, when MIT Media lab professor Rosalind Picard published "Affective Computing." ❶ Javier Hernandez, a research scientist with the Affective Computing Group at the MIT Media Lab, explains emotion AI as a tool that allows for a much more natural interaction between humans and machines. ❷

[C] While humans might currently have the upper hand on reading emotions, machines are gaining ground using their own strengths. Machines are very good at analyzing large amounts of data, explained MIT Sloan professor Erik Brynjolfsson. They can listen to voice inflections and start to recognize when those inflections correlate with stress or anger. Machines can analyze images and pick up subtleties in micro-expressions on humans' faces that might happen even too fast for a person to recognize. ❸

[D] "We have a lot of neurons in our brain for social interactions. We're born with some of those skills, and then we learn more. It makes sense to use technology to connect to our social brains, not just our analytical brains," Brynjolfsson said. "Just like we can understand speech and machines can communicate in speech, we also understand and communicate with humor and other kinds of emotions. ❹ And machines that can speak that language— the language of emotions— are going to have better, more effective interactions with us. It's great that we've made some progress; it's just something that wasn't an option 20 or 30 years ago, and now it's on the table." ❺

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

① Language of Emotions
② New Artificial Intelligence Technology
③ More Natural Interaction Between Humans and Machines
④ Effective Communication in Computing
⑤ Artificial Emotional Intelligence

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

① It was developed for more emotional interactions between humans and machines.
② The study of emotion AI began 25 years ago or earlier.
③ It can be used to improve marketing campaigns.
④ It uses voice inflections in recognizing emotions.
⑤ It analyzes facial expressions.

20. (1.0 points) The following part was removed from the passage. In which part may the following sentences be inserted to support the argument made by the author?

"Think of the way you interact with other human beings; you look at their faces, you look at their body, and you change your interaction accordingly," Hernandez said. "How can [a machine] effectively communicate information if it doesn't know your emotional state, if it doesn't know how you're feeling, and if it doesn't know how you're going to respond to specific content?"

① ❶ ② ❷ ③ ❸ ④ ❹ ⑤ ❺

21. (1.0 points) Which of the following is true according to the above passage?

① Machines read emotions better than humans do.
② Machines can read emotions by analyzing large amounts of data.
③ Artificial intelligence is now being replaced by emotion AI that reacts to human emotions.
④ Emotion AI replicates social interaction in human brain functions.
⑤ Affective computing is an earlier version of emotion AI.

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

[A] Conceptions of self are incredibly powerful forces that shape the destinies of cultures. ❶ It's not an exaggeration to state that the fate of cultures and civilizations, and their ability to adapt to change, is closely tied to how people see themselves. These past 30 years have, I think, witnessed a series of learning in American culture about the self and what it means to be an individual.

[B] Consider the goal of self-fulfillment. The conception in the sixties and seventies was that self-fulfillment consisted of filling as many personal needs as possible: the more needs you met the more self-fulfilled you would be. This was the ethos of "you can have it all" — career, family, affluence, leisure, self-esteem, sexual gratification, self-expression, and guaranteed entitlements. ❷ Today's culture is evolving a different notion of the self. It holds that self-fulfillment is not a matter of how many needs you can fill, but whether there is a good fit between you and the world in which you live.

[C] In the moral domain, the assumption in the 1980s was: "if I want it and it isn't illegal, why shouldn't I have it?" The image of the self here is that of an autonomous individual governed by needs, wants, self-interests, and external constraints only in the form of the law. ❸ There is a growing realization that lots of perfectly legal actions hurt other people and are morally wrong. The ancient truth that moral rules are not always relative to individual preferences and that there is such a thing as "right" and "wrong" is gaining favor. In our tracking studies, we are beginning to measure a shift back toward absolute as distinct from relative values. ❹

[D] Our society is also moving away from the doctrine of need-based rights ("if I need it I have a right to it") to a conception of the self as part of a larger community, enmeshed in a network of responsibilities and obligations as well as rights. ❺ We are edging toward a concept of (a) reciprocity— the idea that people should not expect to get something for nothing and that if you are able-bodied and adult, you should give back something for what you receive.

22. (1.0 points) The following part was removed from the passage. In which part may it be inserted to support the argument made by the author?

A shift is now occurring toward a perception of the self as a moral actor with obligations and concerns as well as rights.

① ❶ ② ❷ ③ ❸ ④ ❹ ⑤ ❺

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

① There have been changes in the concept of the self and what it means to be an individual in the American society.
② The image of the individual as an aggregation of needs is now receding.
③ The conviction is growing that we are part of a larger whole.
④ Respect for the willingness to give something up is growing.
⑤ Moral relativism begins to gain support within the society.

24. (0.8 points) Which of the following can the underlined word (a) reciprocity in paragraph [D] be best replaced with?

① consent
② devotion
③ mutualism
④ responsibility
⑤ sacrifice

25. (1.1 points) Which of the following is not included in the author's discussion of conceptions of self?

① the self as a desiring subject
② the self as a moral actor
③ the self as part of community
④ the self as a legal agent
⑤ the self as a spiritual entity

※ (문제 26 - 45) 다음 물음에 답하라.

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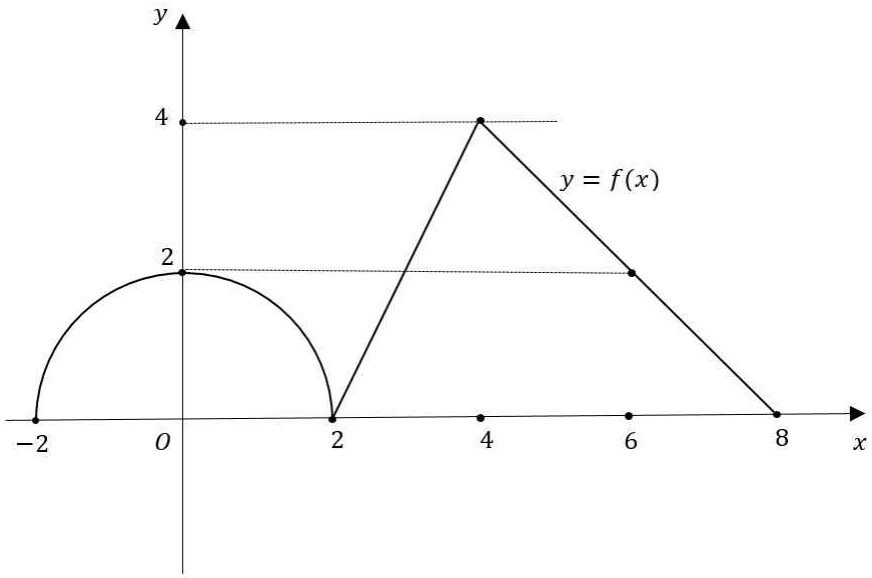
[26] [0.8점] 다음 중 옳지 **않은** 것을 고르라.

① $-1 \le x \le 0$ 이면 $\sin(\cos^{-1} x) \le 0$ 이다.
② $0 \le x \le 1$ 이면 $\sin(\cos^{-1} x) \ge 0$ 이다.
③ $\tan^{-1} x$ 는 모든 실수 x 에 대하여 잘 정의된다.
④ $\sin^{-1}\left(\sin \frac{\pi}{11}\right) = \frac{\pi}{11}$ 가 성립한다.
⑤ 모든 실수 x 에 대하여 $\sin(\sin^{-1}(\sin x)) = \sin x$ 가 성립한다.

[27] [0.8점] 폐구간 $[-2,8]$ 에서 아래와 같은 그래프를 갖는 함수 $y=f(x)$ 에 대해, $g(x) = \int_{-2}^{2x} f(t)\,dt$ $(-1 \le x \le 4)$라 할 때, $(g \circ f)'(3)$을 구하라.



① 16 ② -16 ③ 4 ④ -4 ⑤ 0

[28] [0.8점] 아래 극한을 구하라.

$$\lim_{x \to 1} \frac{1 - \sin\frac{\pi}{2}x}{(x-1)^2}$$

① 발산 ② 0 ③ $\frac{\pi^2}{8}$ ④ $\frac{\pi^2}{4}$ ⑤ $\frac{\pi^2}{2}$

[29] [0.8점] 곡선 $y^2 + 2x = \ln y$ 위의 점 $\left(-\frac{1}{2}, 1\right)$에서의 접선의 기울기를 구하라.

① -4 ② -2 ③ 0 ④ 2 ⑤ 4

[30] [0.8점] 아래 <보기>에서 수렴하는 이상 적분(improper integral)은 **모두** 몇 개인가?

< 보기 >

가. $\int_0^2 \frac{\sin(x-1)}{|x-1|^{3/2}}\,dx$

나. $\int_0^\infty e^{-\sqrt{x}}\,x^{2021}\,dx$

다. $\int_0^1 \frac{1+x^{2021}}{\sqrt{x}}\,dx$

라. $\int_0^\infty \frac{1}{1+x^4}\,dx$

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

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

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

[32] [1.0점] 아래 <보기>의 내용 중 옳은 것은 **모두** 몇 개인가?

< 보기 >

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

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

다. 무한급수 $\sum_{n=0}^{\infty} (-2)^n a_n$이 수렴하면 멱급수 $\sum_{n=0}^{\infty} a_n x^n$의 수렴 반경은 2 이상이다.

라. 멱급수 $\sum_{n=0}^{\infty} a_n x^n$의 수렴 반경이 2 이상이면 무한급수 $\sum_{n=0}^{\infty} (-1)^n a_n$은 수렴한다.

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

[33] [1.0점] 곡선 $y=\dfrac{\sqrt{4-x^2}}{x^3}$ $(1\le x\le 2)$, $x=1$, $x=2$와 x-축으로 둘러싸인 영역을 y-축 주위로 회전하여 얻어진 입체의 부피를 구하라.

① $2\pi\left(\sqrt{3}+\dfrac{\pi}{3}\right)$ ② $2\pi\left(\sqrt{3}-\dfrac{\pi}{3}\right)$ ③ $2\pi\left(1+\dfrac{\pi}{3}\right)$
④ $2\pi\left(1+\dfrac{\pi}{6}\right)$ ⑤ $2\pi\left(1-\dfrac{\pi}{6}\right)$

[34] [1.0점] 수열 $\left\{a_n=(-1)^n\dfrac{n^{-1/2}}{(\ln n)^{1/3}} : n=2,3,4,\cdots\right\}$에 대하여 아래 <보기>에서 수렴하는 것은 **모두** 몇 개인가?

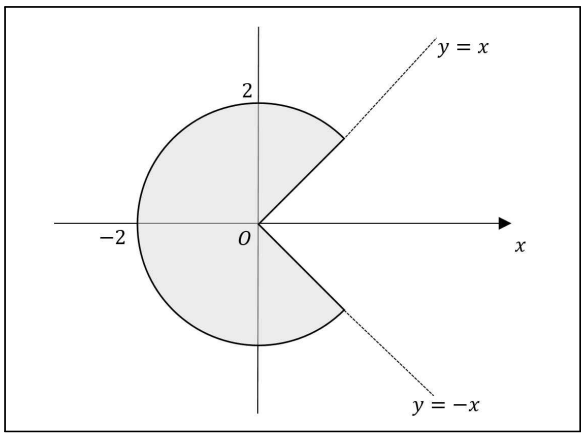
< 보기 >

가. $\displaystyle\sum_{n=2}^{\infty} a_n$ 나. $\displaystyle\sum_{n=2}^{\infty} |a_n|$

다. $\displaystyle\sum_{n=2}^{\infty} a_n^2$ 라. $\displaystyle\sum_{n=2}^{\infty} |a_n|^3$

① 0개 ② 1개 ③ 2개 ④ 3개 ⑤ 4개

[35] [1.0점] 아래 그림에서 색칠된 영역은 중심이 원점이고 반지름이 2 인 원의 일부이다. 이 도형의 무게중심은 $(a,0)$ 이다. 이때 a 를 구하라.



① $-\dfrac{8\sqrt{2}}{9\pi}$ ② $-\dfrac{2\sqrt{2}}{3\pi}$ ③ $-\dfrac{4\sqrt{2}}{9\pi}$ ④ $-\dfrac{\sqrt{2}}{3\pi}$ ⑤ 0

[36] [1.0점] 실수 전체에서 아래와 같이 정의된 함수 f 에 대하여 $f''(0)$을 구하라.

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

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

[37] [1.0점] 아래 적분을 구하라.

$$\int_0^{\frac{\pi}{4}} \int_{\sqrt{y}}^{\frac{\sqrt{\pi}}{2}} \frac{y\cos(x^2)}{x^3}\, dx\, dy$$

① $\frac{1}{\sqrt{2}}$ ② $\frac{1}{4}$ ③ $\frac{1}{2\sqrt{2}}$ ④ $\frac{1}{8}$ ⑤ $\frac{1}{4\sqrt{2}}$

[38] [1.1점] 함수 $f(x)=\cos\left(\frac{1}{6}x^3\right)$ 에 대하여 $f^{(6)}(0)$ 을 구하라.

① -20 ② -10 ③ 0 ④ 10 ⑤ 20

[39] [1.1점] 원점으로부터 곡면 $4x^4+5y^4+13z^4-2x^2y^2z^2=20$ 위의 점 $(1,1,1)$에서의 접평면에 이르는 거리를 구하라.

① $\frac{19}{5}$ ② $\frac{19}{13}$ ③ $\frac{16}{5}$ ④ $\frac{16}{13}$ ⑤ $\frac{13}{5}$

[40] [1.1점] 네 평면 $x+2y+z=2$, $x=2y$, $x=0$, $z=0$ 으로 둘러싸인 입체의 부피를 구하라.

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

[41] [1.0점] 함수 $f(x)=Ae^{\alpha x}\cos(\beta x)+Be^{\alpha x}\sin(\beta x)+Cx+D$ 가 아래 조건을 만족한다.

$$f''(x)+2f'(x)+5f(x)=9+10x$$
$$f'(0)=10$$
$$f(0)=-1$$

이때 $A+B+C+D$ 의 값을 구하라.

① -4 ② -2 ③ 0 ④ 2 ⑤ 4

[42] [1.0점] 세 점 $\mathrm{P}(1,1,1)$, $\mathrm{Q}(5,-2,-1)$, $\mathrm{R}(1,4,2)$를 꼭짓점으로 갖는 삼각형의 넓이를 구하라.

① $\frac{5}{2}$ ② $\frac{5\sqrt{3}}{2}$ ③ $\frac{13}{2}$ ④ $\frac{15}{2}$ ⑤ $\frac{15\sqrt{3}}{2}$

[43] [1.1점] 두 평면 $x=\sqrt{3}y$, $x=y$, 그리고 타원체 $\frac{x^2}{16}+\frac{y^2}{16}+\frac{z^2}{4}=1$ 로 둘러싸인 제1팔분공간(first octant) 상의 입체의 부피를 아래 적분으로 나타낼 수 있다.

$$\int_{\alpha}^{\beta}\int_{0}^{b}F(r)\,dr\,d\theta$$

이때 $(\beta-\alpha)F\left(\frac{b}{2}\right)$ 의 값을 구하라. (단, $0\le\alpha<\beta\le\frac{\pi}{2}$)

① $\frac{\sqrt{3}}{2}\pi$ ② $\frac{1}{6\sqrt{2}}\pi$ ③ $\frac{\sqrt{3}}{6}\pi$ ④ $\frac{\sqrt{2}}{6}\pi$ ⑤ $\frac{1}{\sqrt{3}}\pi$

[44] [1.0점] 함수 $f(x,y)=\dfrac{\sum_{n=0}^{\infty}(-1)^n\dfrac{x^{2n}}{n!}}{\sum_{m=0}^{\infty}\dfrac{y^m}{m!}}$ 를 생각하자.

다음 설명 중 옳지 **않은** 것을 고르라.

① 함수 $f(x,y)$ 는 평면 전체를 정의역으로 가진다.

② $f(-2,-4)=1$ 이 성립한다.

③ 함수 $f(x,y)$ 는 정의역의 모든 점에서 연속이다.

④ $\dfrac{\partial f}{\partial y}(10,20)<0$

⑤ 함수 $f(x,y)$ 가 미분불가능인 점이 있다.

※ (문제 45 – 47) 아래 글을 읽고 물음에 답하라.

※ 영역 $R=\{(x,y):x^2+y^2\le 9\}$ 에서 정의된 함수

$$f(x,y)=(x+y)(x^2+y^2)-6x-6y$$

에 관하여 물음에 답하라.

[45] [1.1점] 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 3 ② 4 ③ 5 ④ 6 ⑤ 7

[46] [1.1점] 영역 R 의 내부에서 함수 f 의 모든 안장점(saddle point)에서의 함숫값의 합을 구하라.

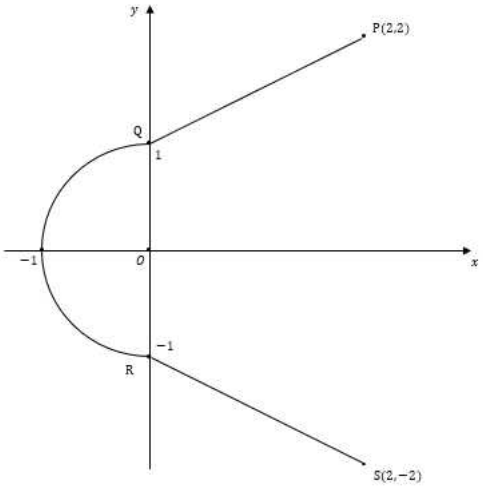
① 8 ② 4 ③ 0 ④ -4 ⑤ -8

[47] [1.1점] 영역 R 에서 f 의 최댓값을 구하라.

① 15 ② $10\sqrt{2}$ ③ 12 ④ $9\sqrt{2}$ ⑤ 8

※ (문제 48 – 50) 아래 글을 읽고 물음에 답하라.

그림에서 점 P(2,2)에서 점 Q(0,1)에 이르는 선분을 C_1, 점 Q(0,1)에서 점 $(-1,0)$을 거쳐 점 R(0,−1)에 이르는 반원을 C_2, 점 R(0,−1)에서 점 S(2,−2)에 이르는 선분을 C_3이라 하자. 이들 곡선 C_1, C_2, C_3를 순차적으로 연결한 곡선을 C라고 하자. 그리고 점 P(2,2)에서 점 S(2,−2)에 이르는 선분을 C_4, 원점을 중심으로 하고 반지름이 2인 **반시계 방향**의 원을 C_5라 하자.



[48] [1.1점] 아래 선적분의 값은 얼마인가?

$$\int_{C_4}\left(-\frac{ydx}{x^2+y^2}+\frac{xdy}{x^2+y^2}\right)$$

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

[49] [1.1점] 아래 선적분의 값은 얼마인가?

$$\int_{C_5}\left(-\frac{ydx}{x^2+y^2}+\frac{xdy}{x^2+y^2}\right)$$

① -4π ② -2π ③ 0 ④ 2π ⑤ 4π

[50] [1.1점] 아래 선적분의 값은 얼마인가?

$$\int_{C}\left(-\frac{ydx}{x^2+y^2}+\frac{xdy}{x^2+y^2}\right)$$

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