2021학년도
아주대학교 편입학 수강능력시험

자연계 오후

성 명	
전 형	
수험번호	

표지를 제외한 페이지 수: 20

Questions 1-3: Choose the word that best completes the sentence.
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1. (0.8 points) Our current cultural heroes, typified more by macho toughness than depth of character, may seem to lack the inner struggle. However, we must remember that epics from the Iliad on were designed first and foremost to entertain, and their heroes have generally been known more for action than _____.

   ① courage
   ② decisiveness
   ③ introspection
   ④ loyalty
   ⑤ passion

2. (0.8 points) "If the queen in a colony dies and the workers fail to rear a replacement queen, some worker bees activate their ovaries and begin to lay eggs," said Beryl Jones, a postdoctoral researcher at Princeton University. "This is an example of 'behavioral _____,' the ability to change behavior in response to the environment," Jones said.

   ① conformity
   ② infinity
   ③ plasticity
   ④ rigidity
   ⑤ sensitivity

3. (0.8 points) We are born into a cultural preconception that we call reality and that we never question. We essentially know the world in terms of that cultural package or preconception, and we are so _____ of it that the most liberal of us go through life with a kind of ethnocentricity that automatically rules out all other ways of seeing the world.

   ① suspicious
   ② unaware
   ③ critical
   ④ cautious
   ⑤ conscious

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

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4. (1.0 points) Because mass communication is a fractured interaction, we can identify actual addressees only *post hoc* by reference back to the people _____.

① intending the communicators to address
② the communicators to address intended
③ to address the communicators intending
④ the communicators intended to address
⑤ intended the communicators to address

5. (1.0 points) The body produces sweat to keep its temperature from rising too much. However, there is a negative tradeoff in that the more the body sweats, _____.

① the more does it lose fluid
② does it lose the more fluid
③ the more fluid does it lose
④ the more fluid it loses
⑤ it loses fluid the more

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) I was just learning the language myself, but I was a quick study, as children ①are with new tongues. I ②had spent kindergarten in almost complete silence, hearing only the high nasality of my teacher and comprehending little but the cranky wails and cries of my classmates. But soon, seemingly mere months later, I ③had already become a terrible ham and mimic, and I ④would crack up my father with impressions of teachers and his friends. My mother scolded me for aping my father's speech, and the one time I attempted to make light of hers I ⑤rate a roundhouse smack on my bottom.

7. (1.0 points) The human body still stands ①<u>at the center of the debate</u>. Skin color matters a lot. Walking down a New York street with lots of melanin pigment in your skin means that ②<u>whenever you are heading</u>, the police might view you with extra suspicion. But the likes of both President Trump and President Obama will explain the significance of skin color ③<u>in cultural and historical terms</u>. The police view your skin color with suspicion not for any biological reason, ④<u>but rather because of history</u>. Presumably, the Trump camp will explain that black criminality is an unfortunate legacy of historical errors ⑤<u>committed by white liberals</u> and black communities.

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 idea that Africa was once covered by a vast, primary forest is a myth invented by colonialists in the early 20th century. Over a period of several million years, the continent's tree cover waxed and waned as the climate warmed and cooled. After humans came along, they cleared some trees and planted others, such that by the time Denys Finch Hatton took Karen Blixen for a spin in his Gipsy Moth— a scene immortalized in Sydney Pollack's 1985 film *Out of Africa*— the Kenyan landscapes they soared over were thoroughly human-sculpted. Starting in the 1930s, colonialists created national parks to protect the forests from the locals who were supposedly destroying them as their populations grew.

(a) Africa has been covered by huge forests from the beginning.
(b) The colonialists in Africa must have destroyed the forests to cope with increasing populations.
(c) The climate change caused changes in Africa's tree cover until humans arrived on that continent.
(d) A famous scene in the movie *Out of Africa* was based on an episode about a person called Denys Finch Hatton.

① (a) & (b)

② (a) & (c)

③ (c) & (d)

④ (a), (c) & (d)

⑤ (b), (c) & (d)

9. (1.1 points) Approaching the edge of a towering cliff is an unnerving experience. Watching another person do so can be equally unsettling. Our brain's capacity to process these boundaries is important— not only for avoiding such dangers, but also for navigation in general, because borders that divide spaces can help to locate resources. For instance, a steep ravine might be risky to amble through, but also useful for locating food or friends. How does our brain keep track of such information? Writing in *Nature,* Stangl et al. report that brain rhythms at a particular frequency increase when navigating near boundaries. This rhythm is also present when watching another person navigate.

(a) Our brain is able to sense spatial boundaries.

(b) Recognizing spatial boundaries can be helpful for locating resources.

(c) Our brain provides an internal signal when we navigate near boundaries.

(d) Watchers share the brain activity when another person navigates near boundaries.

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① (a) & (b)

② (b) & (c)

③ (a) & (c)

④ (a), (c) & (d)

⑤ (a), (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] Plastic is undoubtedly a problem. If current trends continue, its production will account for about 15% of all greenhouse gas emissions by 2050, and once produced it is notoriously difficult to dispose of. About eight million metric tons of the stuff enters our oceans each year and accumulates, proving deadly to many kinds of wildlife.

[B] At least by the end of 2019, however, it seemed that campaigns to reduce and replace single-use bags and other plastic items were beginning to take off worldwide: inspired in the UK by the BBC's documentary series. But all that changed in early 2020, and we are now in a very different world. Only a few months after the first cases of an unusual pneumonia, certain plastic items— those used for personal protective equipment, or PPE— had become some of the most in-demand items around the world. Much of this is by nature single-use and it must all be disposed of, **(a) exacerbating** the known problems with plastic waste. As Laurent Lombard of the French conservation group Operation Mer Propre said, "Soon there will be more discarded masks than jellyfish in the waters of the Mediterranean." So, as the pandemic will be here until we manage the huge feat of vaccinating billions of people, does the future have to be more plastic?

[C] (1) _____ Generally, the optimum solutions for any problem are those nearest to the top of the list, but this cannot apply here. During a pandemic, refusing to use PPE or reducing its availability might be merely foolhardy (in a supermarket, for instance) but it would often be criminally dangerous. Therefore, we need to rethink PPE with sustainability in mind, and this mainly involves two things: moving away from single-use items wherever possible and changing the composition of the materials so they rot at the end of their useful life.

[D] From an environmental point of view, an ideal material would have two attributes that are, in the real world, often incompatible: it would be both reusable and biodegradable. The single-use gloves that are almost ubiquitous in clinical care are often made from natural latex rubber, extracted from rubber trees. This natural product biodegrades easily, and latex-based PPE causes little pollution. However, other types of PPE such as surgical gowns and masks are almost always made of oil-derived polymers such as non-woven polypropylene. These are cheap, and they effectively protect the wearer from pathogenic microbes carried in droplets, but they are not easily biodegradable. Non-woven polypropylene is commonly used to make the 'bags for life' promoted by supermarkets.

10. (1.1 points) Which of the following would be the best title for the above passage?

① Avoiding Single-Use Materials
② Problems of Recycling Biogradables
③ The Public Health Challenge of the Pandemic
④ Sustainable COVID-19 Protection
⑤ Discarding Face Masks

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

① Battling plastic waste in the long term is even more complex than battling the virus is today.
② The important question, however, is how far this new knowledge will make our pandemic practices more sustainable.
③ The pandemic is certainly teaching us a great deal about the manufacture, recycling, and disposal of plastics and novel materials.
④ If the volume of discarded face masks is to be reduced, each face mask should be both biodegradable and reusable, and that can be addressed by using novel materials.
⑤ When thinking through the environmental burden of any product, it can be helpful to use a framework such as the 'seven Rs of sustainability' : rethink, refuse, reduce, repurpose, reuse, recycle, and rot.

12. (0.8 points) Which of the following can the underlined word (a) exacerbating in paragraph [B] be best replaced with?

① aggravating
② constituting
③ eradicating
④ evacuating
⑤ impeding

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

① Being reusable and being biodegradable can often work well together in reality.
② Environmentally ideal materials should be both naturally decayable and reusable.
③ The movement to reduce plastic products started to gain popularity in early 2019.
④ 'Bags for life' were provided by supermarkets because of their eco-friendly attribute.
⑤ If we reduce the use of plastic, greenhouse gas emissions will drop by 15 percent in 2050.

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

[A] In premodern times religions were responsible for solving a wide range of technical problems in (a) <u>mundane</u> fields such as agriculture. Divine calendars determined when to plant and when to harvest, while temple rituals secured rainfall and protected against pests. When an agricultural crisis loomed as a result of drought or a plague of locusts, farmers turned to the priest to (b) <u>intercede</u> with the gods. Medicine too fell within the religious domain. Almost every prophet, guru, and shaman doubled as a healer. Thus, Jesus spent much of his time making the sick well, the blind see, the mute talk, and the mad sane. Whether you lived in ancient Egypt or in medieval Europe, if you were ill you were likely to go to the witch doctor rather than to the doctor, and to make a pilgrimage to a renowned temple rather than to a hospital.

[B] In recent times the biologists and the surgeons (c) <u>have taken over from</u> the priests and the miracle workers. If Egypt is now struck by a plague of locusts, Egyptians may well ask Allah for help— why not?— but they will not forget to (d) <u>call upon</u> chemists, entomologists, and geneticists to develop stronger pesticides and insect-resistant wheat strains. ❶ If the child of a (e) <u>devout</u> Hindu suffers from a severe case of the measles, the father would say a prayer to Ghanvantari and offer flowers and sweets at the local temple— but only after he has rushed the toddler to the nearest hospital and entrusted him to the care of the doctors there. ❷ Even mental illness— the last bastion of religious healers— is gradually passing into the hand of the scientists, as neurology replaces demonology and Prozac supplants exorcism.

[C] The victory of science has been so complete that our very idea of religion has changed. We no longer associate religion with farming and medicine. ❸ Even many zealots now suffer from collective amnesia, and prefer to forget that traditional religions ever laid claim to these domains. "So what if we turn to engineers and doctors?" say the zealots. "(1) _____"

[D] Traditional religions have lost so much turf because, frankly, they just weren't very good in farming or healthcare. The true expertise of priests and gurus has never really been rainmaking, healing, prophecy, or magic. ❹ A priest is not somebody who knows how to perform the rain dance and end the drought. A priest is somebody who knows how to justify why the rain dance failed, and why we must keep believing in our god even though he seems deaf to all our prayers. ❺

14. (1.1 points) The following sentence was removed from the passage. In which part may it be inserted to support the argument made by the author?

Rather, it has always been interpretation.

① ❶   ② ❷   ③ ❸   ④ ❹   ⑤ ❺

15. (1.1 points) According to the passage, which of the following is NOT true?

① Farmers in premodern times planted their crops according to religious calendars.
② A number of religious zealots now believe in the strong healing power of religion.
③ A contemporary Hindu father, however religious he is, will resort to medical treatments first if his child is sick.
④ The scientific advancement has contributed to the change in the way of viewing religion.
⑤ Medieval Europeans were willing to make a pilgrimage to cure their illnesses.

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

① (a) mundane, very ordinary
② (b) intercede, resent
③ (c) have taken over from, have replaced
④ (d) call upon, request
⑤ (e) devout, pious

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

① What has religion got to do with agriculture or medicine in the first place?
② Has religious authority been dwindling in more and more technical field recently?
③ Is it precisely our genius for interpretation that puts us at a disadvantage when we compete against scientists?
④ Is there considerable disagreement among us about questions of religion?
⑤ Does it mean that traditional religions can help us solve these problems?

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

[A] Though red squirrels are a solitary and territorial species, a 22-year study of these squirrels in the Yukon suggests that they have a higher chance of survival and a greater number of offspring (a) <u>when living</u> near the same neighbors year after year. ❶ These benefits were even more pronounced in older squirrels, who the data suggested could sharply offset the effects of aging by maintaining all of their neighbors from one year to the next. ❷

[B] "Red squirrels live on their individual territory, and they rarely come into physical contact with one another, but (b) <u>given the value of familiar neighbors,</u> our study raises this really interesting possibility that they might cooperate with their competitors," says first author Erin Siracusa, a postdoctoral researcher at the University of Exeter. ❸ "What this cooperation looks like, whether it's sharing of food resources, or actively alarm-calling to warn their neighbors of predators, or potentially even forming coalitions to protect the neighboring territories from usurpers, we don't know. But I would argue (c) <u>based on our findings</u> that despite their solitary nature, red squirrels do engage in social interactions and can have important social relationships." ❹

[C] While it's known that social relationships play a key role for animals that live in groups, Siracusa was interested in learning how social relationships affect solitary, territorial species— who rarely physically interact with their own kind. ❺

[D] Siracusa had previously observed that red squirrels with stable social relationships— established in part through defensive calls known as "rattles" that the squirrels make to identify themselves— were less likely to intrude on each other's territories and pilfer each other's cache. "Once they live next to each other long enough to agree on these territory boundaries, they sort of enter into this gentleman's agreement, saying, 'Okay, we've established these territory boundaries. We know where they are. We're not going to waste our time and energy (d) <u>to fight over these boundaries</u> anymore,'" she says. This reduced aggression in familiar neighbors, known as the "dear enemy" phenomenon, has been established in many species previously, but researchers (e) <u>haven't been able to</u> easily tie the phenomenon to a fitness advantage.

18. (1.1 points) Which of the following would be the best summary of the research findings in the above passage?

① The benefits of the familiarity among older squirrels were more pronounced.
② Territorial red squirrels live longer when they are friendly with their usurpers.
③ The red squirrels establish boundaries to reduce aggression in familiar neighbors.
④ The red squirrels developed a mechanism that works to minimize the costs of territoriality.
⑤ The longer the red squirrels lived near each other, the more likely they were to survive into the next year and produce more offspring.

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

① They are a solitary and territorial species.
② They rarely come into physical contact with their kind.
③ They form coalitions with new comers to protect their territories.
④ They are in social relationships with their neighbors.
⑤ They use rattle calls to protect their boundaries.

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

Surprisingly, the findings show that it didn't matter whether the squirrels' neighbors were related to them; these fitness benefits instead depended on familiarity, or the length of time the same squirrels lived next to each other.

① ❶   ② ❷   ③ ❸   ④ ❹   ⑤ ❺

21. (1.0 points) Choose the underlined word or phrase that must be changed for the sentence to be correct.

① (a) when living
② (b) given the value of familiar neighbors
③ (c) based on our findings
④ (d) to fight over those boundaries
⑤ (e) haven't been able to

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

[A] Divorce affects most children in the short run, but research suggests that kids recover rapidly after the initial blow. In a 2002 study, psychologist E. Mavis Hetherington of the University of Virginia and her then graduate student Anne Mitchell Elmore found that many children experience short-term negative effects from divorce, especially anxiety, anger, shock, and disbelief. These reactions typically diminish or disappear **(a) in the end of the second year**. Only a minority of kids suffer longer.

[B] Most children of divorce also do well in the long term. In a quantitative review of the literature in 2001, sociologist Paul R. Amato, then at Pennsylvania State University, examined the possible effects on children several years after a divorce. The studies compared children of married parents with those who experienced divorce **(b) at different ages**. The investigators followed these kids **(c) into later childhood**, adolescence, or the teenage years, assessing their academic achievement, emotional and behavior problems, delinquency, self-concept, and social relationships. On average, the studies found only very small differences on all these measures between children of divorced parents and those from intact families, suggesting that the vast majority of children endure divorce well.

[C] Researchers have consistently found that high levels of parental conflict during and after a divorce are associated with poorer **(d) adjustment in children**. The effects of conflict before the separation, however, may be the reverse in some cases. In a 1985 study, Hetherington and her associates reported that some children who are exposed to high levels of marital discord prior to divorce adjust better than children who experience low levels. Apparently when marital conflict is muted, children are often unprepared when told about the upcoming divorce. They are surprised, perhaps even terrified, by the news. **(e) In addition,** children from high-discord families may experience the divorce as a welcome relief from their parents' fighting.

[D] Taken together, the findings suggest that only a small percentage of young people experience divorce-related problems. Even here, the causes of these lingering difficulties remain uncertain. Some troubles may arise from conflicts between mom and dad associated with the divorce. The stress of the situation can also cause the quality of parenting to suffer. Divorce frequently contributes to depression, anxiety, or substance abuse in one or both parents and may bring about difficulties in balancing work and child **(1)_____**. These problems can impair a parent's ability to offer children stability and love when they are most in need.

22. (1.1 points) Which of the following would be the best title for the above passage?

① Divorce Reconsidered
② Divorcing Parents' Concerns
③ Impact of Divorce on Children
④ The Co-Parenting After Divorce
⑤ The Welfare of Children of Divorce

23. (0.8 points) Which of the following is LEAST likely to be inserted into blank (1) in paragraph [D]?

① bearing
② care
③ nurturing
④ rearing
⑤ upbringing

24. (1.0 points) Choose the underlined word or phrase that must be changed for the sentence to be correct.

① (a) in the end of the second year
② (b) at different ages
③ (c) into later childhood
④ (d) adjustment in children
⑤ (e) In addition

25. (1.1 points) Which of the following best supports the author's argument?

① High levels of parental conflict have negative effects on children.
② The short-term effects of parental divorce can linger into adolescence or adulthood.
③ Some children fare better if they are removed from the environment of marital conflict.
④ The children who are exposed to high levels of marital discord prior to divorce adjust better than children who experience low levels.
⑤ There are small differences between the children of divorced parents and those of non-divorced parents in terms of academic achievement, emotional and behavior problems, delinquency, self-concept, and social relationships.

※ (문제 26 - 45) 다음 물음에 답하라.
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[26] [0.8점] 다음 중 옳지 **않은** 것을 고르라.

① 실수 전체에서 연속인 함수 f 에 대하여 $f(1) = 1$이면 $\lim\limits_{x \to 1} \ln(f(x)) = 0$이다.

② $\lim\limits_{x \to \infty} \tan^{-1}(x) = \dfrac{\pi}{2}$

③ $\lim\limits_{x \to 1} (\sin(x))^{-1} = \dfrac{\pi}{2}$

④ 모든 실수 x에 대하여 $\tan(\tan^{-1} x) = x$ 가 성립한다.

⑤ $0 < x < \dfrac{\pi}{2}$ 이면, $\sin x > \sin^2 x$ 이 성립한다.

[27] [0.8점] 아래 값을 구하라.

$$\sin\left(\cos^{-1}\left(-\frac{1}{3}\right)\right)$$

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

[28] [0.8점] 아래 극한을 구하라.

$$\lim_{n \to \infty}\left(1 - \sin\left(\frac{1}{3n}\right)\right)^{2n}$$

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

[29] [0.8점] 곡선 $x^4 + y^2 = 4$ 위의 점 $(-1, \sqrt{3})$ 에서 $\dfrac{d^2y}{dx^2}$ 를 구하라.

① $-\dfrac{22}{3\sqrt{3}}$ ② $-22\sqrt{3}$ ③ 0 ④ $22\sqrt{3}$ ⑤ $\dfrac{22}{3\sqrt{3}}$

[30] [0.8점] 두 곡면 $S_1 : \dfrac{x^2}{4} + y^2 - \dfrac{z}{2} = 1$, $S_2 : x^2 + y^2 + z^2 = 9$ 의 교선을 C 라 할 때, 곡선 C 위의 점 $(2,1,2)$에서의 접선을 매개변수 방정식으로 옳게 표현한 것을 고르라.

① $\begin{cases} x = 2 + t \\ y = 1 + 2t \quad (t \text{ 는 실수}) \\ z = 2 - t \end{cases}$
② $\begin{cases} x = 2 - t \\ y = 1 + 2t \quad (t \text{ 는 실수}) \\ z = 2 - t \end{cases}$

③ $\begin{cases} x = 2 + 3t \\ y = 1 + 2t \quad (t \text{ 는 실수}) \\ z = 2 - 2t \end{cases}$
④ $\begin{cases} x = 2 + 3t \\ y = 1 - 2t \quad (t \text{ 는 실수}) \\ z = 2 - 2t \end{cases}$

⑤ $\begin{cases} x = 2 + 2t \\ y = 1 + t \quad (t \text{ 는 실수}) \\ z = 2 - 2t \end{cases}$

[31] [1.0점] 곡선 $y = 2\sqrt{x}$ (단, $3 \le x \le 8$)을 x-축 주위로 회전하여 얻어진 곡면의 넓이를 구하라.

① $\dfrac{76\pi}{5}$ ② $\dfrac{152\pi}{5}$ ③ $\dfrac{76\pi}{3}$

④ $\dfrac{152\pi}{3}$ ⑤ 38π

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

─── < 보기 > ───

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

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

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

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

① 0개   ② 1개   ③ 2개   ④ 3개   ⑤ 4개

[33] [1.1점] 곡선 $y = \sqrt{x}$ 와 $y = \dfrac{x}{2}$ 로 둘러싸인 영역을 직선 $x = -1$을 축으로 회전하여 얻어진 입체의 부피를 구하라.

① $\dfrac{16}{5}\pi$ ② $\dfrac{64}{15}\pi$ ③ $\dfrac{104}{15}\pi$ ④ $\dfrac{128}{15}\pi$ ⑤ $\dfrac{64}{5}\pi$

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

───────── < 보기 > ─────────

가. $\displaystyle\sum_{n=1}^{\infty} a_n$ 나. $\displaystyle\sum_{n=1}^{\infty} a_n^2$

다. $\displaystyle\sum_{n=1}^{\infty} n a_n^3$ 라. $\displaystyle\sum_{n=1}^{\infty} (-1)^n a_n^{2021}$

① 0개   ② 1개   ③ 2개   ④ 3개   ⑤ 4개

[35] [1.0점] 곡선 $y = x^2 - 2$와 직선 $y = 2$로 둘러싸인 영역의 무게중심은 $(0, b)$이다. 이때 b를 구하라.

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

[36] [1.0점] 실수 전체에서 아래와 같이 정의된 함수 f에 대하여 $f''\left(\sqrt{\dfrac{\pi}{2}}\right)$의 값은?

$$f(x) = \int_0^{x^2} |\cos t|\, dt$$

① 존재하지 않음   ② -2 ③ 2
④ -2π ⑤ 2π

[37] [1.0점] 아래 적분의 값을 구하라.

$$\int_0^1 \int_{\sqrt[3]{x}}^1 \sqrt{1+y^4}\, dy\, dx$$

① $\dfrac{1}{6}(\sqrt{2}-1)$
② $\dfrac{1}{6}(2\sqrt{2}-1)$
③ $\dfrac{1}{3}(\sqrt{2}-1)$

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

[38] [1.1점] 함수 $f(x)=\sqrt{1-\dfrac{x^3}{2}}$ 의 $x=0$에서 6차 테일러 다항식을 $P_6(x)$라 할 때 $P_6(1)$의 값은 얼마인가?

① 1
② $\dfrac{3}{4}$
③ $\dfrac{23}{32}$
④ $\dfrac{5}{8}$
⑤ $\dfrac{3}{8}$

[39] [1.0점] 함수 $f(x,y)=\sin\left(\dfrac{\pi}{2}\,xy\right)+2\,x-y^2$ 의 $(1,1)$에서의 선형근사함수 (linear approximation)를 이용하여 $f(1.1,\,0.95)$를 근사한 값은 얼마인가?

① 2.3
② 2.15
③ 2.05
④ 1.95
⑤ 1.85

[40] [1.0점] 아래 멱급수의 수렴 반경을 구하라.

$$\sum_{n=1}^{\infty} \frac{(-1)^n n^2 (n!)^3}{(3n)!}\, x^n$$

① $\dfrac{1}{81}$
② $\dfrac{1}{27}$
③ 1
④ 27
⑤ 81

[41] [1.0점] 아래와 같이 매개변수 방정식으로 주어진 꼬인 위치의 두 직선 ℓ_1 과 ℓ_2 가 있다.

$$\ell_1 : x = 4t,\, y = -3t,\, z = -2t \qquad (t \text{ 는 실수})$$
$$\ell_2 : x = 3,\, y = 3s+1,\, z = s+5 \qquad (s \text{ 는 실수})$$

두 직선 사이의 거리를 구하라.

① 2　　　② 3　　　③ 4　　　④ 5　　　⑤ 6

[42] [1.1점] 곡선 $\{(x,y) : x^2 + 2y^2 = 1\}$ 상에서 함수 $f(x,y) = x^2 y$ 의 최댓값은 얼마인가?

① $\dfrac{1}{3}$　　② $\dfrac{\sqrt{2}}{3}$　　③ $\dfrac{\sqrt{6}}{3}$　　④ $\dfrac{\sqrt{2}}{6}$　　⑤ $\dfrac{\sqrt{6}}{9}$

[43] [1.1점] 아래 표는 다항 함수 $f(x,y)$에 대한 부분적인 정보이다.

(a,b)	$f(a,b)$	$\dfrac{\partial f}{\partial x}(a,b)$	$\dfrac{\partial f}{\partial y}(a,b)$	$\dfrac{\partial^2 f}{\partial x^2}(a,b)$	$\dfrac{\partial^2 f}{\partial x \partial y}(a,b)$	$\dfrac{\partial^2 f}{\partial y^2}(a,b)$
$(0,0)$	0	0	1	1	2	8
$(1,2)$	2	0	0	-1	4	-2
$(-1,1)$	c	0	0	1	2	8
$(2,4)$	d	0	0	-2	-3	-6

<보기>의 설명 중 옳은 것은 **모두** 몇 개인가?

< 보기 >

가. f 는 $(0,0)$에서 극솟값을 가진다.

나. f 는 $(1,2)$에서 극댓값을 가진다.

다. $c < d$.

라. $c = -1$.

① 0개　　② 1개　　③ 2개　　④ 3개　　⑤ 4개

[44] [1.1점] 두 곡면 $z = 12 - x^2 - y^2$, $z = 2x^2 + 2y^2$ 으로 둘러싸인 입체의 부피를 구하라.

   ① 3π ② 6π ③ 12π ④ 24π ⑤ 36π

[45] [1.1점] 반구면 $x^2 + y^2 + z^2 = 4$ (단, $z > 0$) 의 원통 $x^2 + y^2 = 1$ 의 내부에 속하는 부분의 겉넓이를 구하라.

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

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

※ (문제 **46** – **47**) 아래 글을 읽고 물음에 답하라.

이상 적분(improper integral)의 수렴성과 관련한 아래 내용을 상기해 보자.

甲. $\displaystyle\int_0^1 x^{-p}\,dx$ 수렴 $\Leftrightarrow$ $p < 1$

乙. $\displaystyle\int_1^\infty x^{-p}\,dx$ 수렴 $\Leftrightarrow$ $p > 1$

丙. 모든 x에 대하여 $0 \le f_1(x) \le f_2(x)$ 이 성립하고 $\displaystyle\int_a^b f_2(x)\,dx$ 가 수렴하면,

     $\displaystyle\int_a^b f_1(x)\,dx$ 는 수렴한다. (a, b는 각각 실수 또는 음/양의 무한대)

丁. $\displaystyle\int_1^\infty |f(x)|\,dx$ 수렴 $\Rightarrow$ $\displaystyle\int_1^\infty f(x)\,dx$ 수렴

이로부터 $\displaystyle\int_1^\infty \frac{\sin x}{x}\,dx$의 수렴·발산 여부를 알 수 있다.

$$
\begin{aligned}
\int_1^\infty \frac{\sin x}{x}\,dx &= \lim_{b\to\infty} \int_1^b \frac{\sin x}{x}\,dx \\
(*) \qquad &= \lim_{b\to\infty}\left\{ -\frac{\cos b}{b} + \frac{\cos 1}{1} - \int_1^b \frac{\cos x}{x^2}\,dx \right\} \\
&= \frac{\cos 1}{1} - \int_1^\infty \frac{\cos x}{x^2}\,dx
\end{aligned}
$$

<이하 생략>

[46] [1.0점] 아래 <보기>에서 옳은 것은 **모두** 몇 개인가?

───────── < 보기 > ─────────

가. 위 (∗) 과정에서 부분적분이 사용되었다.

나. $\displaystyle\int_1^\infty \frac{|\cos x|}{x^2}dx$ 는 乙, 丙에 의하여 수렴한다.

다. $\displaystyle\int_1^\infty \frac{\cos x}{x^2}dx$ 는 수렴한다.

라. $\displaystyle\int_1^\infty \frac{\sin x}{x}dx$ 는 수렴한다.

① 0개   ② 1개   ③ 2개   ④ 3개   ⑤ 4개

[47] [1.1점] 아래 <보기>에서 수렴하는 이상 적분은 **모두** 몇 개인가?

───────── < 보기 > ─────────

가. $\displaystyle\int_1^\infty \frac{\cos x}{x}dx$ 나. $\displaystyle\int_1^\infty \frac{\cos x}{\sqrt{x}}dx$

다. $\displaystyle\int_\pi^\infty \sin\left(x^2\right)dx$ 라. $\displaystyle\int_0^\infty \frac{\sqrt{x}}{x+x^2}dx$

① 0개   ② 1개   ③ 2개   ④ 3개   ⑤ 4개

※ (문제 48 – 50) 아래 글을 읽고 물음에 답하라.

> ※ 중심이 $(3,3)$이고 반지름이 r인 (단, $r>0$) **반시계 방향**의 원을 C_r 이라고 하자. 그리고 포물선 $y=x^2$ 을 따라 점 $(1,1)$에서 점 $(2,4)$에 이르는 곡선을 $\tilde{C}$ 라 하자. 평면상의 벡터장을 아래와 같이 정의한다.
>
> $$\mathbf{F}_1(x,y) = x\,\mathbf{i} + y\,\mathbf{j}$$
>
> $$\mathbf{F}_2(x,y) = -y\,\mathbf{i} - x\,\mathbf{j}$$
>
> $$\mathbf{F}_3(x,y) = \frac{x}{x^2+y^2}\,\mathbf{i} + \frac{y}{x^2+y^2}\,\mathbf{j}$$
>
> $$\mathbf{F}_4(x,y) = -\frac{2y}{x^2+y^2}\,\mathbf{i} + \frac{2x}{x^2+y^2}\,\mathbf{j}$$
>
> $$\mathbf{F}_5(x,y) = -\frac{y-2}{(x-2)^2+(y-2)^2}\,\mathbf{i} + \frac{x-2}{(x-2)^2+(y-2)^2}\,\mathbf{j}$$

[48] [1.1점] 다음 중 그 값이 다른 것 하나를 찾으라.

① $\displaystyle\int_{C_3}\mathbf{F}_1\cdot d\mathbf{r}$ ② $\displaystyle\int_{C_3}\mathbf{F}_2\cdot d\mathbf{r}$ ③ $\displaystyle\int_{C_3}\mathbf{F}_3\cdot d\mathbf{r}$

④ $\displaystyle\int_{C_3}\mathbf{F}_4\cdot d\mathbf{r}$ ⑤ $\displaystyle\int_{C_3}\mathbf{F}_5\cdot d\mathbf{r}$

[49] [1.1점] 아래 선적분의 값을 구하라.

$$\int_{\tilde{C}}\mathbf{F}_2\cdot d\mathbf{r}$$

① -7 ② -4 ③ 0 ④ 4 ⑤ 7

[50] [1.1점] 아래 극한을 구하라.

$$\lim_{r\to\infty}\int_{C_r}\mathbf{F}_4\cdot d\mathbf{r}$$

① 0 ② 2π ③ 4π ④ 8π ⑤ ∞