2022학년도
아주대학교 편입학 수강능력시험

자연계열

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표지를 제외한 페이지 수: 18

Questions 1-2: Choose the expression that best completes the sentence.

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1. (0.8 points) The packaging of living material into discrete vehicles became _____, when biologists arrived on the scene and started asking questions about life, their questions were mostly about vehicles.

① such a salient and dominant feature that
② salient and dominant a feature such that
③ such that salient and dominant a feature
④ such that a salient and dominant feature
⑤ salient and dominant feature such that

2. (0.8 points) Not stirring a muscle, F'lessan watched the exodus. Only when all made their way down the track, spreading out on their separate ways, _____ the opening.

① did the bronze rider approach
② the bronze rider had approached
③ the bronze rider approaches
④ has approached the bronze rider
⑤ approached the bronze rider

Questions 3-5: Choose the word that best completes the sentence.

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3. (0.8 points) AI may indeed eliminate some categories of jobs but may also spawn _____ jobs that incorporate the new technology into an old format. As was the case with the rollout of electricity at the turn of the 20th century, new fields of study spring up too. Electrical engineers weren't really needed before electricity became something more than a parlor curiosity, after all.

① academic
② engineering
③ field
④ high-tech
⑤ hybrid

4. (1.0 points) Studies into people with facial paralysis show that others do tend to perceive them more negatively. Not being able to read people's facial expressions seems to make us more wary, more suspicious. Interestingly, the same studies reveal that those with facial paralysis tend to compensate for their inability to produce facial expressions by _____ their voice and their body language, conveying their emotions with more exuberant arm movements, larger gestures, more emphasis on words, and so on. And this does indeed make others perceive them more positively.

① articulating
② demonstrating
③ exaggerating
④ refining
⑤ using

5. (1.0 points) In a 2019 meta-analysis, Robbins and a colleague found that, of the 52 minutes a day on average, the 467 subjects spent gossiping, three-quarters of that gossip was actually neutral. Just a small portion of the conversations analyzed (around 15%) was deemed negative gossip (though positive gossip amounted to a smaller portion still, at only 9%). So while it is true that people can spend a significant amount of time talking about their peers, oftentimes that chatter is _____.

① aimless
② benign
③ casual
④ ineffective
⑤ insignificant

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) The ①earlier investigations did not clarify the ②underlying mechanisms or the cells ③involving. Now, by ④studying rats, researchers at the Netherlands Institute for Neuroscience (NIN) in Amsterdam have identified that the ability ⑤to feel the pain of others has to do with "mirror neurons" in the anterior cingulate cortex (ACC).

7. (1.0 points) In these circumstances, variation in exposure to community violence accounts for slightly less than 10% of the variance in psychological distress among the individuals ①comprising the samples. There is not a one-to-one correspondence between amount of exposure and amount of distress; obviously other variables also ②affect the level of psychological distress. Nevertheless, in a broader context, ③the impact of exposure to community violence on psychological distress is substantial. The effect size for the relationship between exposure to community violence and psychological distress ④is equal or larger than the effect sizes estimated by meta-analyses for other psychosocial stressors ⑤such as the experience of child sexual abuse, natural disasters, and negative life events.

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) Companies can start nurturing skills today that they may benefit from later. In 2015, Mercy Health, a US-based not-for-profit healthcare system, partnered with local community colleges in the state of Michigan to fill a skill gap among medical assistants by creating a paid apprenticeship program. Apprentices spend two days a week in class and three days working in physicians' offices for a salary that is underwritten, in part, by a grant from the US Department of Labor. The results are encouraging, with Mercy Health hiring nearly all the alumni of its first two graduating classes. Moreover, the company is exploring the launch of three new apprenticeship programs for other occupations. Programs such as this are intriguing to employers because it lets them tap a new pool of talent and then create and shape the specific skills they need. The approach also holds considerable social promise, as it can be designed to support underemployed groups, such as young people or military veterans.

(a) Mercy Health is planning to operate different apprenticeship programs for other jobs.

(b) Apprenticeship programs can benefit both the hiring companies and underemployed populations.

(c) Mercy Health collaborated with local colleges to run an apprenticeship program for medical assistants.

(d) People participating in the 2015 apprenticeship program offered by Mercy Health were paid, in part, by the US government.

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

9. (1.1 points) The lockdown and social-distancing measures applied around the world to manage the pandemic have led to high rates of mental health problems including depression, anxiety, and post-traumatic stress disorder (PTSD). This makes sense; we know that social isolation can have negative psychological consequences, as can economic uncertainty, rising unemployment, and widespread financial struggles. Aside from the social and economic effects of the pandemic, could catching COVID-19 lead to mental health problems? Those with COVID-19 were twice as likely to get one of the psychiatric diagnoses compared to the other patients. Being hospitalized with COVID-19 put all patients at higher risk, but even a mild form of the illness was associated with developing mental health problems in the three months following diagnosis. Then, would it mean that the virus was finding its way into our brains?

> (a) COVID-19 causes depression and anxiety.
> (b) Viruses are known to infect our brains and cause very serious problems.
> (c) There is a link between COVID-19 cases and an increased risk of psychiatric disorders.
> (d) There could be non-biological reasons for COVID-19 being associated with mental health problems.

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] In the early decades of the 19th century, Britain was far from democratic. Many towns continued to be governed by corrupt groups. New towns that had developed from industrialization were not allowed to elect representatives to Parliament. Often the working classes had no voice in their government except for the protest of riot and rampage. The landed aristocrats controlled both the House of Lords and the House of Commons. Since younger sons of aristocrats did not inherit titles, (a) <u>they were obliged to make careers</u> in business, the military, the church, law, and even the House of Commons. (1)_____ There was much mingling between the upper and middle classes, and the wealthiest merchants tended to buy land, titles, and husbands for their daughters—all of which (b) <u>drew them closer to the aristocracy</u>.

[B] The two greatest political parties in Britain, the Whigs and the Tories, were separated not by class, but by ideas and values. Parliament, the courts, local government, the church, the monarch—all were a part of a social and political system dominated by aristocratic interests and values. The Whigs saw themselves as champions of civil, political, and religious liberties, as well as defenders of parliament and the nation against the tyranny of king and state. The Tories, on the other hand, defended royal authority, the established church, the empire, and imperial glory; they believed that some were born to rule and more to follow. Neither party was democratic, and at the end of 18th century and the beginning of the 19th century, a group of radical reformers criticized both parties as part of a corrupt oligarchy that (c) <u>deprived the people of ancient liberties</u> and a voice in government.

[C] In 1815, at the end of the Napoleonic Wars, when (d) <u>returning veterans found no work</u>, Britain faced depressions in the industrial areas and unrest in the rural districts. Both the Whigs and the Tories, afraid that the revolutionary ideas of the Jacobins had infected the English masses, urged strict measures repressing any agitation or violence. Crimes against property, such as the Luddites' burning of machinery, were severely punished. Workers were forbidden to organize.

[D] In 1819, at St. Peter's Fields near Manchester, a meeting of radical reformers, who wanted to change the suffrage law, ended when the troops and militia fired on workers (e) <u>who was gathered there</u>. Nicknamed the Peterloo Massacre in derisive comparison to the great victory of Waterloo, the incident seemed to encourage the government to increase repression.

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

① Economic and Political Policies
② The Rise of Reform
③ Benefits of a Liberal Government
④ Changes in Social Structure
⑤ The Process of Industrialization

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

① Thus, the social separation of noble and commoners was not complete in Britain.
② After all, this development seemed to prove that the classical economists had been right.
③ Accordingly, the leaders decided it was imperative to educate the masses since they had political power.
④ Therefore, the British ability to absorb protest without succumbing to revolution came to be regarded as a miracle.
⑤ In that way, a general rise in prosperity benefited the British working class while at the same time it enriched the upper class.

12. (1.0 points) Choose the underlined word or phrase that must be changed for the sentence to be correct.

① (a) they were obliged to make careers
② (b) drew them closer to the aristocracy
③ (c) deprived the people of ancient liberties
④ (d) returning veterans found no work
⑤ (e) who was gathered there

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

① The working class was able to express their political opinions by electing representatives to Parliament after industrialization.
② The Whigs were more democratic than the Tories because the former defended parliament and the nation against the dictatorship of the king.
③ Revolutionary movements were supported by both the Whigs and the Tories after the Napoleonic wars.
④ Some radical reformers criticized both the Whigs and the Tories for not allowing the people to voice their opinions in government.
⑤ The Peterloo massacre took its name from the victory of Waterloo to commemorate the radicals' victory against the government.

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

[A] Should a mother have a favorite, or should she be equally (a) altruistic toward all her children? At the risk of being boring, I must yet again throw in my customary warning. The word 'favorite' carries no subjective connotations, and the word 'should' no moral ones. I am treating a mother as a machine programed to do everything in her power to (b) propagate copies of the genes which reside inside her. ❶ Since you and I are humans who know what it is like to have conscious purposes, it is convenient for me to use the language of purpose as a metaphor in explaining the behaviors of survival machines.

[B] In practice, what would it mean to say a mother had a favorite child? It would mean she would invest her resources unequally among her children. (1)_____ Food is the obvious one, together with the effort expended in gathering food, since this in itself costs the mother something. ❷ Energy and time devoted to nest or home maintenance, protection from the elements, and time spent in teaching children are valuable resources which a parent can (c) allocate to children, equally or unequally as she chooses.

[C] It is difficult to think of a common currency in which to measure all these resources that a parent can invest. ❸ Just as human societies use money as a universally convertible currency which can be translated into food, land, or labor time, we require a currency in which to measure resources that an individual survival machine may invest in another individual's life, in particular a child's life. A measure of energy such as the calorie is (d) tempting, and some ecologists have devoted themselves to the accounting of energy costs in nature. This is inadequate though, because it is only loosely convertible into the currency that really matters, the gold-standard of evolution, gene survival. R.L. Trivers, in 1972, neatly solved the problem with his concept of parental investment. ❹

[D] Parental investment is defined as an investment by a parent in an individual offspring that increases the offspring's chance of surviving (and hence reproductive success) at the cost of the parent's ability to invest in other offspring. The beauty of Triver's parental investment is that it is measured in units very close to the units that really matter. ❺ When a child uses up some of its mother's milk, the amount of milk is measured not in pints, but in units of (e) detriment to other children of the same mother.

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?

> Risk undergone in protecting you from predators is another resource which the mother can spend or refuse to spend.

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 When measuring parental investment in a child, the parent's ability to invest in other children needs to be disregarded.
② Having a favorite child would mean a mother's unequal distribution of her resources among her children.
③ The word 'favorite' conveys only a literal meaning according to the author's definition.
④ Some ecologists' accounting of energy costs in nature is not well received by the author.
⑤ The resources that a mother can invest may include food, effort, energy, and time.

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

① (a) altruistic, selfless
② (b) propagate, produce
③ (c) allocate, give out
④ (d) tempting, attractive
⑤ (e) detriment, sacrifice

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

① The answer is that there is no genetic reason for a mother to have favorites.
② The resources that a mother has available to invest consist of a variety of things.
③ A child is just as closely related to each of his brothers and sisters as the mother is to them.
④ A particular adult individual has a certain total quantity of parental investment available to invest in children.
⑤ Parental investment is not quite an ideal measure because it overemphasizes the importance of parentage.

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

[A] Choice is a fundamental American value that often lies at the center of heated political discussions. For example, disputes about the Affordable Healthcare Act have hinged on whether buying health insurance should be a personal choice. ❶

[B] In a recent paper published in Psychological Science, Krishna Savani of the National University of Singapore Business School and Aneeta Rattan of Stanford University had American participants watch a short video of a person doing (1) mundane activities in an apartment, such as opening mail or reading a magazine. Some participants were asked to press a button whenever they saw the person in the video touch an (2) object. Other participants were asked to press the button whenever they perceived that the person in the video was making a choice. Later all participants were asked to read about public policies designed to (3) redistribute educational resources in a community in order to make things more equal between the wealthy and the poor. Those who had been (4) prompted to think about choices, regardless of their own political (5) leanings, expressed less support for the equalizing policies. ❷

[C] The results from the studies may have something to do with how closely Americans associate choice with freedom. When Americans are made to think about choice, they may shift their attitudes in favor of policies that promote individual freedom rather than restrict it. ❸

[D]　Since choice and freedom are emphasized to a greater degree in Western countries, Savani and his colleagues wanted to know whether their results would hold up in a different culture. They designed a study where American or Indian participants were asked to either choose small items for themselves or simply describe items that somebody else already chose. Then, all participants were shown a picture of an African child who was described as poor and facing starvation. They were asked how much money they would be willing to donate to the child and how upset they were by the child's situation. For Americans, the act of making a simple choice caused them to feel less upset about the starving child's plight. For Indians, making this choice had no effect on how they felt towards the child. Their level of distress about the child was the same, regardless of whether they had been asked to make a choice. ❹ Making choices, even trivial ones, may symbolize something important to Americans but not to Indians. For Americans, the idea of choice may be more strongly linked to ideals such as independence from societal constraints. Even a minor focus on small choices can activate these ideals, leading Americans to overemphasize the role that choice has in shaping their life outcomes. The potential downside is that for Americans, thinking about life in terms of choices may decrease their interest in helping others. ❺

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

① Western Emphasis on Choice and Freedom
② Understanding the Psychology of the American Idea of Choice
③ American Freedom of Choice
④ The Relationship between Choice and Individual Freedom
⑤ Comparison of Asian and American idea of Choice

19. (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?

> When viewed through the lens of choice, people's misfortunes are seen as caused by the actions they've taken rather than situations they have encountered. This may seem to bode poorly for solving social problems that require cooperation.

① ❶   ② ❷   ③ ❸   ④ ❹   ⑤ ❺

20. (0.8 points) Which of the following pairs includes an expression that CANNOT replace the underlined expression in the passage?

① (1) <u>mundane</u>, everyday
② (2) <u>object</u>, item
③ (3) <u>redistribute</u>, separate
④ (4) <u>prompted</u>, spurred
⑤ (5) <u>leanings</u>, inclinations

21. (1.1 points) Which of the following best supports the studies of Savani and his colleagues?

① For Americans, the idea of choice may be more strongly linked to ideals such as independence from societal constraints.
② Thinking about their lives in terms of choices may reduce Americans' support for public policies that promote greater equality in society.
③ Thinking about choice may lead Americans to view inequality as less bothersome.
④ Choice may lead Americans to focus on how people's freely chosen actions lead to either poverty or wealth, making wealth inequality seem like a reasonable result rather than a public problem that needs to be solved.
⑤ If cooperation and helpfulness are framed as expressions of choice and free will, Americans may become even more charitable than others.

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

[A] That link between imitation and humanity is at the **(a) crux** of a new trend in evolutionary science: theories claiming that a class of nerve cells, **(b) dubbed** "mirror neurons" for their ability **(c) to mirror** the actions of others, were the spark that allowed our **(d) hominid** ancestors to branch off from apes. Monkeys and apes also have these neurons but, claim the theories, the humanoid brain **(e) capitalized** on them in new ways that allowed them to move beyond simple imitation to more complex imitation, and that in turn blossomed into language, music, art, tool-making, and even empathy.

[B] University of California, San Diego, neuroscientist and mirror-neuron proponent Vilayanur Ramachandran, MD, PhD, gives these cells credit for causing the big bang of human development, **(1) otherwise** known as the "great leap forward." That leap occurred somewhere around 50,000 years ago, when human culture experienced a sudden explosion of technological sophistication, widespread cave art, clothes, stereotyped dwellings, and the like.

[C] While many researchers think Ramachandran goes too far with his claims, a large and growing group is intrigued enough by mirror neurons **(2) that** more researchers have begun to investigate their potential role in human evolution. "They are a mechanism of connecting me with you, one person with another, **(3) therefore** may play a vital role in communication and social interaction," says psychologist Sarah-Jayne Blakemore, PhD, of the Institute of Cognitive Neuroscience at University College London.

[D] Researchers from diverse fields have been attracted to mirror-neuron theories of human evolution **(4) because** they are testable. If, for example, a trait like human empathy evolved from mirror neurons, it stands to reason that people who lack empathy would have a dysfunctional mirror-neuron system. That's exactly **(5) what** preliminary research on autism—a disorder that leaves people incapable of understanding others' feelings—is showing.

22. (0.8 points) Which of the following pairs includes an expression that CANNOT replace the underlined expression in the passage?

① (a) crux, core
② (b) dubbed, termed
③ (c) to mirror, to imitate
④ (d) hominid, ancient
⑤ (e) capitalized, took advantage of

23. (1.1 points) Which of the following is NOT true according to the above passage?

① Monkeys and apes have mirror neurons.

② Mirror neurons may play a vital role in communication and social interaction.

③ Some researchers saw the potential to link mirror neurons to human evolution.

④ How mirror neurons function in the brains of those with autism can be known with more research.

⑤ Autism, a condition characterized by a lack of empathy, may be due to a deficit of mirror neurons in the brain.

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

① Once humans had the ability to imitate and learn through imitation, transmission of culture could continue by leaps and bounds.

② Some researchers see that mirror neurons are key to cultural advances that separated us from the apes.

③ A scholar sees that mirror neurons primed the human brain for the great leap forward by allowing us the ability to imitate and learn from others.

④ Mirror neurons were sufficient for humans to evolve more sophisticated traits.

⑤ Why humans, not monkeys or apes, developed the sophisticated abilities cannot be explained clearly.

25. (1.0 points) Choose the underlined word or phrase that must be changed for the sentence to be correct.

① (1) otherwise

② (2) that

③ (3) therefore

④ (4) because

⑤ (5) what

[26] [0.8점] $\alpha = \sin^{-1}\left(\sin\left(\frac{11}{7}\pi\right)\right)$ 에 관한 내용 중 **옳지 않은** 것을 고르라.

   ① $\cos\alpha + \sin\alpha > 0$

   ② $\alpha < 0$

   ③ $\sin\alpha = \sin\left(\frac{11}{7}\pi\right)$

   ④ $\cos\alpha = \cos\left(\frac{11}{7}\pi\right)$

   ⑤ $\cos 2\alpha < 0$

[27] [0.8점] 아래 극한을 구하라.

$$\text{< 아래 >}$$
$$\lim_{n\to\infty}\left(1 - \sin\left(\frac{2}{\sqrt{n}}\right)\right)^n$$

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

[28] [1.0점] <**보기**>에서 수렴하는 이상 적분(improper integral)은 **모두** 몇 개인가?

$$\text{< 보기 >}$$

가. $\displaystyle\int_0^\infty \frac{e^{-x^2}}{|x-2|^{3/2}}\,dx$ 나. $\displaystyle\int_0^\infty \frac{1+x^{2022}}{\sqrt{x}}\,dx$

다. $\displaystyle\int_0^\infty e^{-(\ln x)^2}\,dx$ 라. $\displaystyle\int_0^\infty \frac{x}{1+2x+x^2}\,dx$

   ①   0개   ②   1개   ③   2개   ④   3개   ⑤   4개

[29] [1.0점] 함수 $f(x) = \dfrac{2}{1+2x-x^2}$ 에 대한 $x=1$에서의 8차 테일러 다항식을 $P(x)$라 할 때 $P^{(6)}(1)$의 값을 구하라.

   ①   30   ② -45 ③   45   ④ -90 ⑤   90

[30] [1.0점] 함수 $f(x,y) = (x+2y)^3$ 의 $(-1,1)$ 에서의 선형근사함수(linear approximation)를 이용한 $f(-1.1, 1.1)$ 의 근삿값을 구하라.

   ①   1.1   ②   1.2   ③   1.3   ④   1.4   ⑤   1.5

[31] [1.0점] 실수로 이루어진 수열 $\{a_n\}$에 대한 <보기>의 내용 중 옳은 것은 <u>모두</u> 몇 개인가?

─ < 보기 > ─

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

나. 무한급수 $\displaystyle\sum_{n=1}^{\infty} a_n^2$이 수렴하면 $\displaystyle\sum_{n=1}^{\infty} a_n^3$은 수렴한다.

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

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

①   4개   ②   3개   ③   2개   ④   1개   ⑤   0개

[32] [1.0점] 수열 $\left\{ a_n = \dfrac{1}{n^{1/3}(\ln n)^{2/5}} : n = 2, 3, 4, \cdots \right\}$에 대하여 <보기>에서 수렴하는 것은 <u>모두</u> 몇 개인가?

─ < 보기 > ─

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

다. $\displaystyle\sum_{n=2}^{\infty} a_n^3$ 라. $\displaystyle\sum_{n=2}^{\infty} a_n^4$

①   4개   ②   3개   ③   2개   ④   1개   ⑤   0개

[33] [1.1점] 영역 $\{(x,y) : x^2 + 2y^2 \leq 1\}$에서 정의된 함수 $f(x,y) = x^3 - 2y^3$의 최댓값을 M, 최솟값을 m이라 할 때 $M - m$의 값을 구하라.

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

[34] [1.0점] 아래 적분을 구하라.

─ < 아래 > ─

$$\int_0^1 \sin^{-1} x \; dx$$

① 존재하지 않음　　② $\dfrac{\pi}{2}-1$　　③ 1

④ $\dfrac{\pi}{3}$　　⑤ $\dfrac{\pi}{2}$

[35] [1.0점] 아래 적분을 구하라.

> ―――― < 아래 > ――――
>
> $$\int_0^\infty e^{-x}\sin 2x\,dx$$

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

[36] [1.1점] 아래 적분을 구하라.

> ―――― < 아래 > ――――
>
> $$\int_0^{81}\int_{\sqrt[4]{x}}^3 \cos\left(\frac{\pi}{1458}y^5\right)dy\,dx$$

① 1　　② $\dfrac{1}{\sqrt{2}}$　　③ $\dfrac{729}{5\pi}$　　④ $\dfrac{1458}{5\pi}$　　⑤ $\dfrac{486}{\pi}$

[37] [1.0점] 꼬인 위치의 아래 두 직선 ℓ_1, ℓ_2 사이의 거리를 구하라.

> ―――― < 아래 > ――――
>
> $\ell_1:\quad x-1=\dfrac{y-2}{2}=-\dfrac{z}{3}$　　　　　　$\ell_2:\quad x=-z,\ y=0$

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

[38] [1.1점] 곡면 $z=x^2+2y$ 의 일부인 S 는 xy-평면 상의 세 점 O$(0,0)$, A$(1,0)$, B$(1,1)$ 을 꼭짓점으로 갖는 삼각형(내부 포함)을 정사영으로 가진다. 이때 S 의 넓이를 구하라.

① $\dfrac{9}{4}-\dfrac{5}{8}\sqrt{5}$　　② $\dfrac{9}{4}-\dfrac{5}{12}\sqrt{5}$　　③ $\dfrac{5}{4}-\dfrac{5}{12}\sqrt{5}$

④ $\dfrac{3}{2}$　　⑤ $\dfrac{5}{4}$

[39] [1.1점] 아래 적분을 구하라.

< 아래 >

$$\int_{-1}^{1} \int_{0}^{\sqrt{1-x^2}} \int_{\sqrt{3(x^2+y^2)}}^{\sqrt{1-x^2-y^2}} y \sqrt{x^2+y^2+z^2} \, dz \, dy \, dx$$

① $\dfrac{1}{5}$　　② $\dfrac{\pi}{30}-\dfrac{\sqrt{3}}{40}$　　③ $\dfrac{\pi}{30}+\dfrac{\sqrt{3}}{40}$　　④ $\dfrac{\pi}{30}-\dfrac{\sqrt{3}}{20}$　　⑤ $\dfrac{\pi}{30}+\dfrac{\sqrt{3}}{20}$

※ 문제 40 - 42

실수 전체 집합에서 정의된 함수 f와 g가 아래 성질을 만족한다.

< 아래 >

가. $f(x) = \dfrac{1}{3}x^3 + \dfrac{2}{3}x + 1$　　　　**나.** g는 f의 역함수이다.

물음에 답하라.

---

[40] [0.8점] $g(5)$를 구하라.

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

[41] [0.8점] $g'(5)$를 구하라.

① $\dfrac{1}{2}$　　② $\dfrac{3}{7}$　　③ $\dfrac{3}{10}$　　④ $\dfrac{3}{14}$　　⑤ $\dfrac{1}{5}$

[42] [1.0점] 아래 정적분을 구하라.

< 아래 >

$$\int_{2}^{5} g(x)\,dx$$

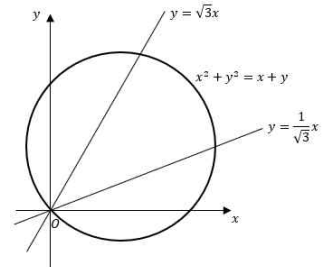① $\dfrac{20}{3}$　　② 6　　③ $\dfrac{16}{3}$　　④ 5　　⑤ $\dfrac{19}{4}$

※ 문제 43 - 44

곡선 $x^2 + y^2 = x + y$는 원이다. 이를 극방정식으로는
$r =$ ____(가)____ (으)로 나타낼 수 있다. 영역
$\left\{ (x,y) : x^2 + y^2 \le x + y, \ y \le \sqrt{3}\,x, \ y \ge \dfrac{1}{\sqrt{3}}\,x \right\}$의 넓이는
____(나)____ 이다. 물음에 답하라.

（그림: 좌표평면의 원 $x^2 + y^2 = x + y$ 와 직선 $y = \sqrt{3}x$, $y = \dfrac{1}{\sqrt{3}}x$）

---

[43] [0.8점] 빈칸 (가)에 적합한 식을 고르라.

① $\cos\theta$ ② $\sin\theta$ ③ $\cos\theta + \sin\theta$

④ $\dfrac{1}{2}\cos\theta + \dfrac{1}{2}\sin\theta$ ⑤ $2\cos\theta + 2\sin\theta$

[44] [1.1점] 빈칸 (나)에 적합한 값을 고르라.

① $\dfrac{\pi}{12} + \dfrac{1}{4}$ ② $\dfrac{\pi}{24} + \dfrac{1}{8}$ ③ $\dfrac{\pi}{12} + \dfrac{1}{8}$ ④ $\dfrac{\pi}{24} + \dfrac{1}{4}$ ⑤ $\dfrac{1}{2}$

※ 문제 45 - 47

양의 실수 a에 대하여 곡선 $y = e^{-x}$ $(0 \le x \le a)$의 길이를 $L(a)$, 이 곡선을 x-축 주위로 회전시켜 얻은 곡면의 넓이를 $A(a)$, 그리고 영역 $\left\{ (x,y) : 0 \le y \le e^{-x}, \ 0 \le x \le a \right\}$ 을 y-축 주위로 회전시켜 얻은 입체의 부피를 $V(a)$라 하자. 물음에 답하라.

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[45] [1.0점] 다음 중 **옳지 않은** 것을 고르라.

① $L(a)$는 증가함수이다.
② 모든 양수 a에 대하여 부등식 $L(a) \ge a$가 성립한다.
③ 모든 양수 a에 대하여 부등식 $L(a) \le 2a$가 성립한다.
④ $L'(1) = \sqrt{2}$
⑤ $\displaystyle\lim_{a \to \infty} \frac{L(a)}{a} = 1$

[46] [1.1점] 극한 $\displaystyle\lim_{a \to \infty} \frac{A(a)}{\pi}$ 를 구하라.

① $\sqrt{2} + \ln(\sqrt{2}+1)$ ② $\sqrt{2} - \ln(\sqrt{2}+1)$ ③ $\sqrt{2}\ln(\sqrt{2}+1)$
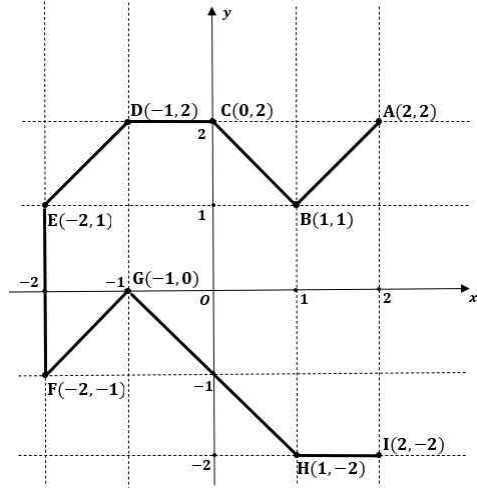
④ $\sqrt{2}\ln(\sqrt{2}-1)$ ⑤ ∞

[47] [1.1점] 극한 $\displaystyle\lim_{a \to \infty} V(a)$ 를 구하라.

① π ② 2π ③ 3π ④ 4π ⑤ ∞

※ 문제 48 - 50

점 $A(2,2)$에서 출발하여 점 $B(1,1)$, 점 $C(0,2)$, 점 $D(-1,2)$, 점 $E(-2,1)$, 점 $F(-2,-1)$, 점 $G(-1,0)$, 점 $H(1,-2)$를 거쳐 점 $I(2,-2)$에 이르는 선분들로 구성된 곡선을 C_1이라 하고(오른쪽 그림 참조), 점 $A(2,2)$에서 출발하여 $I(2,-2)$에 이르는 선분을 C_2라 하자. 물음에 답하라.

[48] [1.1점] 아래 선적분을 구하라.

< 아래 >

$$\int_{C_1}(-y\,dx + x\,dy)$$

① -2 ② 6 ③ 14 ④ 22 ⑤ 30

[49] [1.1점] 아래 선적분을 구하라.

< 아래 >

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

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

[50] [1.1점] 아래 선적분을 구하라.

< 아래 >

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

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