

※ [1-25번: 문항 당 2점]

1. 구간 $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ 에서 정의된 함수 $f(x) = \sin x$ 의 역함수를

$f^{-1}(x) = \sin^{-1}x$ 라 할 때, $\cos\left(2\sin^{-1}\left(\frac{2}{3}\right)\right)$ 의 값은?

- ① $\frac{1}{27}$
- ② $\frac{1}{9}$
- ③ $\frac{1}{3}$
- ④ $\frac{4}{9}$
- ⑤ $\frac{2}{3}$

2. 다음 중 극한값이 1이 아닌 것은?

- ① $\lim_{n \rightarrow \infty} n \tan \frac{1}{n}$
- ② $\lim_{n \rightarrow \infty} n^2 \left(1 - \cos\left(\frac{1}{n}\right)\right)$
- ③ $\lim_{n \rightarrow \infty} n \ln\left(\frac{n+1}{n}\right)$
- ④ $\lim_{n \rightarrow \infty} n^{\frac{1}{n}}$
- ⑤ $\lim_{n \rightarrow \infty} 2^{\sin \frac{1}{n}}$

3. 극한 $\lim_{x \rightarrow 0} \left(\frac{\int_0^{x^2} \sin 2t \, dt}{\int_0^x x^2 \tan t \, dt} \right)$ 의 값은?

- ① 1
- ② 2
- ③ 3
- ④ 4
- ⑤ 5

4. 다음과 같이 정의된 함수 $h(x)$ 가 실수 전체에서 연속일 때, a 의 값은?

$$h(x) = \begin{cases} \tan\left(\frac{\pi x}{2}\right), & x < -\frac{1}{3} \text{ or } x > \frac{2}{3} \\ ax + b, & -\frac{1}{3} \leq x \leq \frac{2}{3} \end{cases}$$

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

5. 다음은 이상적분 $\int_0^{\frac{1}{\pi}} \frac{1}{\sqrt{x}} \sin \frac{1}{x} dx$ 가 수렴함을 보이는 풀이 과정이다. [가]와 [나]에 적합한 것은?

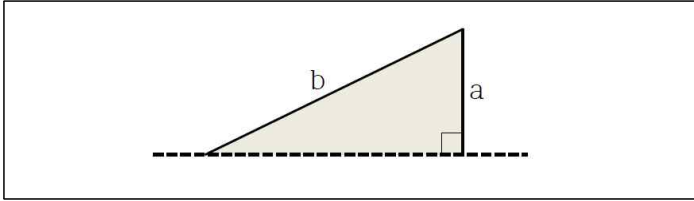
수열 $\{a_n\}$ 의 일반항을 $a_n = \int_{\frac{1}{n\pi}}^{\frac{1}{(n+1)\pi}} \frac{1}{\sqrt{x}} \sin \frac{1}{x} dx$ 라 하자. 모든 실수 x 에 대하여 $|\sin x| \leq 1$ 이므로 $|a_n| \leq$ [가]이다. 따라서 [나]에 의하여 급수 $\sum_{n=1}^{\infty} a_n$ 은 절대수렴한다. 그러므로 이상적분 $\int_0^{\frac{1}{\pi}} \frac{1}{\sqrt{x}} \sin \frac{1}{x} dx = \lim_{n \rightarrow \infty} \int_{\frac{1}{n\pi}}^{\frac{1}{\pi}} \frac{1}{\sqrt{x}} \sin \frac{1}{x} dx$ 가 수렴한다.

- | | [가] | [나] |
|---|-------------------------|---------|
| ① | $\frac{1}{n\sqrt{n+1}}$ | 비교판정법 |
| ② | $\frac{1}{n\sqrt{n+1}}$ | 교대급수판정법 |
| ③ | $\frac{1}{n}$ | 비교판정법 |
| ④ | $\frac{1}{n}$ | 교대급수판정법 |
| ⑤ | $\frac{1}{n}$ | 비율판정법 |

6. 함수 $f(x) = \int_0^{x^2} \sin(xt) dt$ 의 미분 $f'(1)$ 의 값은?

- ① $\cos 1 + 3\sin 1 + 1$
- ② $3\cos 1 + \sin 1 + 1$
- ③ $\cos 1 + 3\sin 1 - 1$
- ④ $3\cos 1 + \sin 1 - 1$
- ⑤ $\cos 1 - 3\sin 1 - 1$

7. 길이가 1m인 철사를 한 번 구부려서 다음 그림의 실선과 같이 만들고자 한다. 점선을 중심으로 이 철사를 회전하여 얻은 원뿔의 부피가 최대가 되도록 하는 a 의 길이는?



- ① $\frac{1}{2}$ m
- ② $\frac{2}{5}$ m
- ③ $\frac{1}{3}$ m
- ④ $\frac{2}{7}$ m
- ⑤ $\frac{1}{4}$ m

8. 구간 $(-1, 1)$ 에서 정의된 함수 $f(x) = \tan x$ 의 역함수 $f^{-1}(x)$ 에 대하여 $g(x) = f^{-1}(x^2)$ 이라 할 때, $g^{(6)}(0)$ 의 값은?

- ① -240
- ② -120
- ③ 0
- ④ 120
- ⑤ 240

9. 실수 전체에서 정의된 함수 $f(x) = 2x^3 + 3x$ 에 대하여 극한값

$$\lim_{n \rightarrow \infty} n f^{-1}\left(\frac{1}{n}\right)$$

- ① $\frac{1}{3}$
- ② $\frac{1}{6}$
- ③ $\frac{1}{9}$
- ④ $\frac{1}{12}$
- ⑤ $\frac{1}{15}$

10. 멱급수 $\sum_{n=1}^{\infty} \frac{n!(2n)!}{(3n)!} x^{3n}$ 의 수렴반지름은?

- ① $\frac{1}{\sqrt[3]{4}}$
- ② $\frac{2}{\sqrt[3]{4}}$
- ③ $\frac{3}{\sqrt[3]{4}}$
- ④ $\frac{4}{\sqrt[3]{4}}$
- ⑤ $\frac{5}{\sqrt[3]{4}}$

11. 두 변량 x 와 y 에 대하여 순서쌍 (x, y) 의 데이터

$(1, 2), (2, 3), (3, 6), (4, 7)$ 을 수집하였다. $\sum_{i=1}^4 (y_i - mx_i - b)^2$ 의 값이 최소가 되는 m 과 b 에 대하여 $m+b$ 의 값은?

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

12. 분지 형태의 지형을 갖는 지역의 위치 (x, y) 에서 높이가 함수 $h(x, y) = 10 + x^4 + 3(x - y)^2$ 으로 주어진다. 위치 $(1, 2)$ 에서 높이가 가장 빨리 변하는 방향은?

- ① $(1, -1)$
- ② $(1, -2)$
- ③ $(1, -3)$
- ④ $(1, -4)$
- ⑤ $(1, -5)$

13. 임의의 양수 t 에 대하여 시간 t 초 후의 위치가 다음 식으로 주어지는 입자의 최대 속력은?

$$(x, y) = (2t - \sin t, 2 - \cos t)$$

- ① 1
- ② 2
- ③ 3
- ④ 4
- ⑤ 5

14. 방정식 $2x^3 + 3y^3 + z^3 - 5xyz = 1$ 로 정의되는 곡면과 방정식 $x^2 + y^2 = 1$ 로 정의되는 원통이 만나는 교선을 매개화한 곡선 $\alpha(t) = (\cos t, \sin t, z(t))$ 에 대하여 $z'(0)$ 의 값은?

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

15. 네 꼭짓점이 $A(1,1,2), B(1,2,1), C(2,1,1), D(2,2,2)$ 인 사면체 $ABCD$ 의 부피는?

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

16. 이변수함수 $f(x,y)$ 와 모든 실수 t 에 대하여 항등식 $f(tx,ty) = t^9 f(x,y)$ 가 성립할 때, 다음 항등식에서 k 의 값은?

$$x^2 \frac{\partial^2 f}{\partial x^2}(x,y) + 2xy \frac{\partial^2 f}{\partial x \partial y}(x,y) + y^2 \frac{\partial^2 f}{\partial y^2}(x,y) = k f(x,y)$$

- ① 9
- ② 27
- ③ 36
- ④ 72
- ⑤ 81

17. 두 곡면 T_1 과 T_2 가 각각 다음 방정식으로 정의된다.

$$T_1 : x^2 + y^2 + z^2 = 12$$

$$T_2 : z = (x-1)^2 + (y-1)^2$$

두 곡면이 만나는 교선을 C 라 할 때, 곡선 C 의 점 $(2,2,2)$ 에서의 접선 위에 놓인 점은?

- ① $(1,1,2)$
- ② $(2,1,2)$
- ③ $(3,1,2)$
- ④ $(4,1,2)$
- ⑤ $(5,1,2)$

18. 반지름이 R 인 원판 $D_R = \{(x,y) | x^2 + y^2 \leq R^2\}$ 에 대하여 다음 극한값은?

$$\lim_{R \rightarrow \infty} \iint_{D_R} e^{-(x^2+y^2)} dA$$

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

19. 평면상의 세 직선 $y = x, y = 0, x = 2$ 로 둘러싸인 영역을 D 라 할 때, 변환 $F(x,y) = (x+y, xy)$ 에 의한 상 $F(D)$ 의 넓이는?

- ① $\frac{2}{3}$
- ② $\frac{4}{3}$
- ③ 2
- ④ $\frac{8}{3}$
- ⑤ $\frac{10}{3}$

20. 곡선 $\sqrt[3]{x^2} + \sqrt[3]{y^2} = 1$ 로 둘러싸인 영역 중 $x > 0, y > 0$ 인 부분을 D 라 할 때, 이중적분 $\iint_D \frac{1}{\sqrt[3]{xy}} dA$ 의 값은?

- ① $\frac{1}{8}$
- ② $\frac{3}{8}$
- ③ $\frac{5}{8}$
- ④ $\frac{7}{8}$
- ⑤ $\frac{9}{8}$

21. 이중적분 $\int_0^{\frac{1}{2}} \int_{\frac{1}{2} + \sqrt{\frac{1}{4} - y^2}}^{\frac{1}{2} + \sqrt{\frac{1}{4} - y^2}} \frac{1}{\sqrt{x^2 + y^2}} dx dy$ 의 값은?

(단, 계산과정에서 다음 적분공식을 사용할 수 있음.)

$$\int \sec \theta d\theta = \ln |\sec \theta + \tan \theta| + C$$

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

22. 극좌표로 표현된 곡선 $r = \sin 2\theta$ 로 둘러싸인 영역의 넓이는?

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

23. 다음 공간상의 입체 E 를 xy 평면, yz 평면, xz 평면으로 정사영한 영역의 넓이를 각각 S_1, S_2, S_3 라 할 때, $S_1 + S_2 + S_3$ 의 값은?

$$E = \{(x, y, z) \mid 0 \leq x \leq 1, 0 \leq z \leq y, \sqrt{y} \leq x \leq 1\}$$

- ① 1
- ② $\frac{7}{6}$
- ③ $\frac{4}{3}$
- ④ $\frac{3}{2}$
- ⑤ $\frac{5}{3}$

24. 공간에서 곡면 $x = y^2$ 과 세 평면 $x = z, z = 0, x = 1$ 로 둘러싸인 입체의 밀도함수가 $\rho(x, y, z) = x$ 일 때, 이 입체의 질량은?

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

25. 공간의 영역 $E = \{(x, y, z) \mid x^2 + \frac{y^2}{4} + z^2 \leq 1\}$ 에 대하여 삼중적분

$$\iiint_E \left(x^2 + \frac{y^2}{4} + z^2\right) dV$$

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

32. 다음 글의 밑줄 친 부분 중, 어법상 틀린 것은?

Not a lot is known about what causes "ice cream headaches" or "brain freeze" as these headaches are commonly called. Scientists know that this type of headache is triggered by cold food or drink ① hitting the roof of the mouth, but they still have no idea what causes the pain. One theory suggests that pain is caused because the blood vessels constrict from the cold.

Scientists do know that the pain reaches its peak somewhere between 25 and 60 seconds after eating or drinking something too cold and that the temperature of the forehead ② falls by almost 2 degrees. The pain typically lasts from a few seconds to a minute or two.

Although this type of headache ③ can be occurred anytime, it is more common during very hot weather or when a person is overheated. Hot weather and ice cream seem to go together, ④ which is probably the reason why most ice cream headaches occur in the summer.

There are two ways to avoid ice cream headaches. One is to eat the ice cream more slowly. ⑤ The other is to keep the ice cream in the front of your mouth because the back of the mouth is usually associated with these headaches.

33. 다음 글의 빈칸 (A), (B)에 공통으로 들어갈 말로 가장 적절한 것은?

More than 500 years ago, the artist and scientist Leonardo da Vinci made a sketch of what was considered at the time to be the ideal human body. His famous drawing of "The Vitruvian Man" shows a handsome man of perfect proportions, each outstretched arm and leg exactly the same length as its mate. The illustration offers an example of bilateral ____ (A) ____ - where the left and right side of a body are more or less a mirror image of one other. But it turns out that ____ (B) ____ is more than just a Renaissance ideal of beauty. Modern scientists have found that it offers many advantages. Even when the differences are tiny, the most symmetric people tend to be faster and healthier than their more irregular counterparts. They're also considered more attractive - and they even smell better!

- ① polarity ② symmetry ③ synthesis
- ④ distortion ⑤ modification

34. 글의 흐름으로 보아, 주어진 문장이 들어가기에 가장 적절한 곳은?

In the 11th century, the Chinese government began issuing these receipts which became the world's first paper money.

Coins were very convenient to use, but they were heavy. (①) In 10th century China, iron coins had square holes in the middle, and string was used to tie them together in heavy bundles of one hundred. (②) People began leaving these bundles with merchants in exchange for receipts. (③) The receipts could be used over time to purchase goods from the merchants. (④) The money would be worthless if the government did not guarantee its value. (⑤) Paper currency has no value if the people do not have confidence in its worth.

35. 다음 글의 빈칸에 들어갈 말로 가장 적절한 것은?

After simple animal skins, wool is probably the oldest material used for making clothing. We do not know exactly when people started to make woolen clothing, but it was probably quite early in human history. The wool was made from the hair of whatever kind of animal people had available. Most of the time these were sheep, but in some dessert areas people made cloth from camel hair. In other areas, they used goat hair, and in the mountains of South America, they used the hair from llamas. All these kinds of wool _____: They protect a person's body from outside changes in temperature. Woolen clothing keeps the body cool in summer and warm in winter.

- ① have one thing in common
- ② should be handled carefully
- ③ contain special chemical elements
- ④ are made from the same species of animal
- ⑤ originate from a specific region in the world

36. 다음 글의 주제로 가장 적절한 것은?

Plant breeders who choose genetic engineering over traditional cross-breeding are able to get desired traits faster and with more consistency. The safety of genetically engineered foods, however, has been a critical issue in bringing these products to markets. Consumers who have food allergies are concerned that genetically altered foods will cause allergic reactions. For example, if a gene from a wheat plant is used to provide resistance to disease in corn plants, will a person who is allergic to wheat products have an allergic reaction after eating the genetically altered corn?

- ① Recent development of genetic engineering
- ② Advantages of genetic engineering technology
- ③ Potential danger of genetically altered foods
- ④ Conflicts between consumers and food market
- ⑤ Genetic similarities between wheat and corn

37. 다음 글의 "Pakicetus"에 대한 설명으로 올바른 것은?

Scientists wondered for a long time just how whales are related to land mammals, especially the largest land mammal, the elephant. They believed there must have been some kind of in-between mammal that lived partly in the sea and partly on the land. They had no evidence for such an animal, however, until the discovery of the bones of an animal scientists have called "Pakicetus." This large mammal, which was alive 50 million years ago, lived on the land but found its food in the water.

- ① 코끼리보다는 고래에 가까운 동물이다.
- ② 주로 물속에 사는 포유동물이다.
- ③ 5천만 년 전 지구에 살았다.
- ④ 아직까지 뼈가 발견된 적이 없다.
- ⑤ 먹이는 육지에서 구했다.

[42-43] 다음 글을 읽고, 물음에 답하십시오.

When your paper is returned to you, spend time (A) examining the comments your teacher made. This is a good time to compare your classmates' responses to your teacher's. (B) taken into account the changes you made between the original draft and the revised paper. Did you improve on the parts of your original paper (C) that your classmates encouraged you to work on? Did your teacher comment on aspects of your paper that your classmates did not comment on? Share this information with the classmates you did peer-editing with. For each paper you (D) looked at, compare the comments you made to the teacher's comments. Keep in mind the ideas you and your teacher had in common about each paper. Also (E) notice comments that your teacher made that you missed. This is valuable information. You'll use it the next time you write and the next time you do peer-editing.

42. 밑줄 친 (A)~(E) 가운데, 어법상 틀린 것은?

- ① (A) ② (B) ③ (C)
- ④ (D) ⑤ (E)

43. 위 글의 주제로 가장 적절한 것은?

- ① Advantages and disadvantages of peer feedback
- ② Several tips for efficient drafting and proofreading
- ③ Importance of sharing ideas in peer-editing projects
- ④ Using wisely teacher's and peer's feedback in writing
- ⑤ Why we should consider others' feeling in peer-editing

[44-45] 다음 글을 읽고, 물음에 답하십시오.

Entranced by elephants, British citizen James Howard Williams moved to Burma in the 1920s to be a forest assistant at the Bombay Burmah Trading Corporation just so he could work with the world's largest animals. Not long after he started his job, Billy – as Williams was known – saw an elephant trying to carry a heavy pile of logs cradled in his tusks and trunk. As the bull headed up a steep hill, the timber was in danger of rolling up and over the top of his head. Struggling, the tusker put the logs down and picked up a bamboo stake. He positioned the bamboo in his mouth, pointing it up like a backstop, and then grasped the logs again, secured with the stake. Experiences like this convinced Williams that elephants were the most intelligent animals in the world, able to _____. They were always acquiring new skills because their brains, much like ours, were built to learn throughout their lives. "The elephant never stops learning, because he is always thinking," he said.

44. 위 글의 제목으로 가장 적절한 것은?

- ① The Brain Size of Elephants Matters
- ② Use of Elephants' Power in the Forest
- ③ Elephants Are In Danger of Extinction
- ④ Elephants: The Most Intelligent Animals
- ⑤ What is the Largest Land Animal in the World?

45. 위 글의 빈칸에 들어갈 말로 가장 적절한 것은?

- ① replace human beings in the forest
- ② improvise novel solutions to problems
- ③ survive massive deforestation in Burma
- ④ outlive any other large animals in the forest
- ⑤ use their tusks and trunk to carry heavy logs

[46-47] 다음 글을 읽고, 물음에 답하십시오.

Legumes are a category of vegetables that includes beans, lentils, and peas. In many parts of the world, legumes are an important basic food. They usually do not cost much, and they are full of protein, vitamins, and minerals. People in the United States and Canada generally do not eat many legumes. Instead, they spend a lot of money on meat. Meat has protein, too, but it also has a lot of unhealthy fat and cholesterol. In fact, many North Americans would _____ if they ate more legumes.

46. 위 글의 빈 칸에 들어갈 말로 가장 적절한 것은?

- ① eat less meat
- ② spend more money
- ③ take more cholesterol
- ④ get more protein
- ⑤ be healthier

47. 위 글의 'legumes'에 대한 설명으로 올바른 것은?

- ① 영양소가 풍부한 대신 값이 비싸다.
- ② 미국과 캐나다 등 북미에서 즐겨 먹는다.
- ③ 단백질과 함께 콜레스테롤도 많이 들어있다.
- ④ 비타민과 미네랄이 풍부한 기초적 식재료이다.
- ⑤ 주로 콩류에 많이 들어있는 영양소의 일종이다.

[48-49] 다음 글을 읽고, 물음에 답하십시오.

A point often brought up these days is that every young person wants to be famous 'just for fame's sake.' A generation is growing up in a society that embraces the status of celebrity, even when some celebrities do not appear to actually 'do' anything much. In days gone by, celebrity status was achieved by being 'good' at something – and not just 'good', but one of the best in the game. Now, however, we have celebrities gracing the covers of magazines who do not actually seem to possess any particular talent at all. Brought up on a diet of reality TV and celebrity magazines, many seem to have lost both the ambition and the desire to work hard towards a credible goal. They think they can 'make it' without the drive and determination, long hours and sacrifices made by those at the top.

It's not all about those who audition, either. Thousands of _____ young people are fixated on shows like these, and become convinced that this is the path to the good life. Rather than nurture an ambition to become a doctor, scientist, teacher, etc., too many teens become convinced that success is reached through becoming noticed in a TV talent show. Most of these young people will never have a shot at 'making it', simply because they do not possess the talent needed.

48. 위 글의 주제로 가장 적절한 것은?

- ① Efficient ways of living a good life
- ② Generation gap between young and old
- ③ Harmful effects of TV talent shows on young people
- ④ How to be successful in the entertainment business
- ⑤ Positive aspects of reality TV and celebrity magazines

49. 위 글의 빈칸에 들어갈 말로 가장 적절한 것은?

- ① intellectual ② judicious ③ critical
- ④ impressionable ⑤ progressive

