

# 2019학년도 송실대학교 편입학 시험 문제



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2019학년도 숭실대학교 편입학 시험 문제 (자연계)

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지망학과(부) :

수험번호 :

성명 :

문항배점 : [1-10] 1점 / [11-20] 2.5점 / [21-25] 3점 / [26-31] 1.7점 / [32-44] 2점 / [45-50] 2.3점

[1-2] Choose the one that is grammatically NOT correct. (각 1점)

[1] "People ask me what I want ① to remember for, and I generally say peace and human rights," he says. "I think it's a basic right of a human being ② to have a home that's decent in which ③ to raise children, and to have an adequate amount of health care and to have an adequate amount of education ④ to take advantage of whatever talent God may have given them."

[2] For many teachers, this year's ① uprising is decades in the making. The country's roughly 3.2 million full-time public-school teachers are ② experiencing some of the worst wage stagnation of any profession, ③ earning less on average, in inflation-adjusted dollars, than they ④ doing in 1990, according to Department of Education data.

[3-6] Choose the expression that is closest in meaning to the underlined part. (각 1점)

[3] Sequoias are mighty trees that can live for more than 3,000 years and grow to a height of nearly 300 ft. But they're not invincible.

① flexible      ② productive      ③ rewarding      ④ secure

[4] Political convictions lead us to lazy thinking. But there's an even more fundamental impulse at play: our innate desire for an easy answer.

① conflicting      ② deliberate      ③ natural      ④ ultimate

[5] Scientists now understand how HIV hides itself inside cells and remains unnoticed from the immune system's watchful gaze—and they have some ideas about how to expose and annihilate it.

① analyze      ② reclaim      ③ destroy      ④ stimulate

[6] Under the new regulation, companies will also be required to disclose now ubiquitous data breaches within 72 hours.

① common      ② famous      ③ notorious      ④ powerful

[7-10] Choose the most appropriate word(s) for the blank. (각 1점)

[7] The social impact of the mass media is obvious. Consider a few examples. TV dinners were invented to accommodate the millions of \_\_\_\_\_, who can't bear to miss their favorite television programs.

① couch potatoes      ② boy scouts  
③ sport maniacs      ④ teenage boys

[8] Essentially, linguistic data comes in two general forms, written or spoken. However, there are also \_\_\_\_\_ categories, such as texts that are written to be spoken (e.g. lectures, plays, etc.), and which may therefore exhibit features that are in between the two clear-cut variants.

① distinctive      ② immediate      ③ intermediate      ④ separate

[9] Kids may be better than adults at learning new languages for many reasons. Children's brains are more \_\_\_\_\_ than those of adults, meaning they're better able to adapt and respond to new information.

① idealistic      ② plastic      ③ rigid      ④ visionary

[10] Excessive alcohol may be damaging to brain neurons and can therefore compromise cognitive function, the scientists believe. \_\_\_\_\_, on the other hand, may deprive the brain of some of the potential benefits of alcohol in keeping blood flow strong, which nourishes the neurons involved in higher brain functions.

① Abstaining      ② Boozing      ③ Indulgence      ④ Workouts

[11-13] Read the following passage and answer the questions. (각 2.5점)

American football draws as much attention lately for the knocks that players take as it does for their drives down the field. The emergence of research linking head collisions with behavioral and cognitive changes similar to those seen in Alzheimer's patients puts the colliding in a new context. Whether ramming opponents head-on or butting helmets, athletes may face the risk of long-term brain injury from hits accumulated over time.

Brain degeneration from repeated blows to the head had been known in boxers since the 1920s as dementia pugilistica, or punch-drunk syndrome. Recent research indicates that small impacts can cause damage as much as big ones, widening the field of concern to young athletes, hockey players, and soldiers subject to head-rattling blasts.

At the University of North Carolina, where football players receive an average of 950 hits to the head each season, neuroscientist Kevin Guskiewics and colleagues have spent six years analyzing impact data from video recordings and helmets equipped with accelerometers. They note that there are plans to test similar technologies on various football teams starting soon. Guskiewics believes that on-field monitoring and education are paths to progress. Already the spotlight on football-related brain trauma has resulted in new football practices, state laws, and congressional hearings on ways to protect young athletes.

On the ( A ) side, there is hope for advanced brain-imaging techniques, experimental blood or spinal fluid tests, and even a genetic marker that would enable doctors to identify chronic traumatic encephalopathy (CTE, the same as punch-drunk syndrome, but not limited to boxers) early on. At the moment, the definitive mark of the disease—clumps of abnormal tau protein in the brain—can be seen only when the brain is sliced, stained, and studied under a microscope. CTE typically appears years after head traumas, and "we don't want to diagnose a disease after death," says Ann McKee, co-director of Boston University's Center for the Study of Traumatic Encephalopathy.

Guskiewics envisions databases that track all the hits athletes take throughout their playing years to help explain neurologic changes later in life. But, he says, (B) "it'll probably be my grandchildren who are analyzing that data."

[11] Which of the following best fits in (A)?

① medical      ② ethical      ③ political      ④ athletic

[12] Which of the following is closest in meaning to (B)?

① Data collection was finished long ago.  
② Analysis of data is not possible right now.  
③ Guskiewics cannot have access to data now.  
④ Accumulating data will be grandchildren's job.

[13] Which of the following is true?

① Alzheimer's patients pave a new way toward colliding.  
② Small impacts on brain is more dangerous than big ones.  
③ New measures are already in effect to protect football players.  
④ CTE typically appears right after head traumas.

[14-15] Read the following passage and answer the questions. (각 2.5점)  
 Adolescents in the U.S. today have a reputation for being more fragile, less resilient and more overwhelmed than their parents were when they were growing up. Sometimes they're called spoiled or coddled or helicoptered. But a closer look paints a far more heartbreaking portrait of why young people are suffering. Anxiety and depression in high school kids have been on the rise since 2012 after several years of stability. It's a phenomenon that cuts across all demographics—suburban, urban and rural; those who are college bound and those who aren't. Family financial stress can exacerbate these issues, and studies show that girls are more at risk than boys.

According to a 2015 report of the Department of Health and Human Services, about 3 million teens ages 12 to 17 had had at least one major depressive episode in the previous year. More than 2 million report experiencing depression that impairs their daily function. About 30% of girls and 20% of boys—totaling 6.3 million teens—have had an anxiety disorder, according to data from the National Institute of Mental Health.

Experts suspect that these statistics are on the low end of what's really happening, since many people do not seek help for anxiety and depression. A 2015 report from the Child Mind Institute found that only about 20% of young people with a diagnosable anxiety disorder get treatment. It's also hard to quantify behaviors related to depression and anxiety, like nonsuicidal self-harm, because they are deliberately ( A ).

Still, the number of distressed young people is on the rise, experts say, and they are trying to figure out how best to help. Teen minds have always craved stimulation, and their emotional reactions are by nature urgent and sometimes debilitating. The biggest variable, then, is the climate in which teens navigate this stage of development.

[14] Which of the following best fits in (A).

- ① harmful      ② conscious      ③ secretive      ④ jealous

[15] Which of the following is NOT true?

- ① Today's American adolescents are regarded as mentally weaker than those of their parents' generation.  
 ② Around 3 million American kids between 12 and 17 experienced one or more major depressions in 2014.  
 ③ Girls have shown higher percentage of depression disorder than boys in the U.S.  
 ④ A 2015 report shows that about 80% of American youngsters suffering from diagnosable anxiety disorder received treatment.

[16-18] Read the following passage and answer the questions. (각 2.5점)

*The New Negro: An Interpretation* (1925) is an anthology of fiction, poetry, and essays on African and African-American art and literature edited by Alain Locke, who lived in Washington, DC and taught at Howard University during the Harlem Renaissance. As a collection of the creative efforts coming out of the burgeoning New Negro Movement or Harlem Renaissance, the book is considered by literary scholars and critics to be the definitive text of the movement. This book included Locke's title essay "The New Negro," as well as nonfiction essays, poetry, and fiction by many of the African American writers.

*The New Negro* dives into how the African Americans sought social, political, and artistic change. ( A ) accepting their position in society, Locke saw the New Negro as championing and demanding civil rights. In addition, his anthology sought to change old stereotypes and replaced them with new visions of black identity that resisted simplification. The essays and poems in the anthology mirror real life events and experiences. The anthology reflects the voice of middle class African American citizens that wanted to have equal civil rights like the white, middle class counterparts.

A theme used by Locke commonly is this idea of the Old vs the New Negro. The Old Negro according to Locke was a product of stereotypes and judgments that were put on them, not ones that they created. They were forced to live in a shadow of themselves and others' actions. The New Negro is a Negro that now has an understanding of oneself. They at one point lacked self-respect and self-dependence which has created a new dynamic and allowed the birth of the New

Negro. They have become the Negro of today which is also the changed Negro. Locke speaks about the migration having an effect on the Negro leveling the playing field and increasing the realm of how the Negro is viewed because they were moved out of the southern parts of U.S. and into other areas where they could start over. The migration in a sense transformed the Negro and fused them together as they all came from all over the world, all walks of life, and all different backgrounds.

[16] Which of the following best fits in (A)?

- ① In behalf of      ② In case of      ③ In light of      ④ Instead of

[17] Which of the following is NOT true about the book *The New Negro*?

- ① It was written by Alain Locke alone.  
 ② It includes works from a variety of literary genre.  
 ③ It deals with African Americans' effort for a new identity.  
 ④ It reflects the real life experiences well.

[18] Which of the following is NOT a feature of the New Negro?

- ① crave for a new identity      ② quest for black supremacy  
 ③ knowledge of oneself      ④ demand for civil rights

[19-20] Read the following passage and answer the questions. (각 2.5점)

Andrés Segovia Torres was a virtuoso Spanish classical guitarist from Linares, Spain. Many professional classical guitarists today were students of Segovia, or students of his students. Segovia's contribution to the modern-romantic repertoire included not only commissions but also his own transcriptions of classical or baroque works. He is renowned for his expressive performances: his wide palette of tone, and his distinctive musical personality, phrasing and style.

Segovia's first public performance was in Granada at the age of 16 in 1909. A few years later he played his first professional concert in Madrid, which included works by Francisco Tárrega and his own guitar transcriptions of J.S. Bach. Despite the discouragement of his family, who wanted him to become a lawyer, and criticism by some of Tárrega's pupils for his idiosyncratic technique, he continued to pursue his studies of the guitar diligently.

He played again in Madrid in 1912, at the Paris Conservatory in 1915, in Barcelona in 1916, and made a successful tour of South America in 1919. Segovia's arrival on the international stage coincided with a time when the guitar's fortunes as a concert instrument were being revived, largely through the efforts of Miguel Llobet. It was in this changing milieu that Segovia, thanks to his strength of personality and artistry, coupled with developments in recording and broadcasting, succeeded in making the guitar more popular again.

Segovia can be considered a catalytic figure in granting respectability to the guitar as a serious concert instrument capable of evocativeness and depth of interpretation. He can be credited to have dignified the classical guitar as a legitimate concert instrument before the discerning music public, which had hitherto viewed the guitar merely as a limited, if sonorous, parlor instrument.

[19] Which of the following is NOT true about Segovia?

- ① His public debut was made at the age of 16.  
 ② His first professional concert was after a few years of his debut.  
 ③ His family strongly opposed to his being a professional guitarist.  
 ④ His public career began with the tour of South America.

[20] Which of the following is true?

- ① Segovia stuck to the conventional playing technique.  
 ② All of Tárrega's pupils praised Segovia's idiosyncratic playing technique.  
 ③ Miguel Llobet contributed little to the revival of the guitar as a concert instrument.  
 ④ Segovia played a crucial role in making the guitar a dignified concert instrument.

[21-22] Read the following passage and answer the questions. (각 3점)

In a comprehensive report released recently by the Association for Psychological Science, the authors closely examine 10 learning tactics and rate each from high to low utility on the basis of the evidence they've amassed. Here is a quick guide to the report's conclusions.

Highlighting and underlining led the authors' list of ineffective learning strategies. Although they are common practices, studies show they offer no benefit beyond simply reading the text. Some research even indicates that highlighting can get in the way of learning; because it draws attention to individual facts, it may hamper the process of making connections and drawing inferences. Nearly as bad is the practice of rereading, a common exercise that is much less effective than some of the better techniques you can use. Lastly, summarizing, or writing down the main points contained in a text, can be helpful for those who are skilled at it, but again, there are far better ways to spend your study time. Highlighting, underlining, rereading and summarizing were all rated by the authors as being of "low utility."

( A ) familiar practices like highlighting and rereading, the learning strategies with the most evidence to support them aren't well known outside the psych lab. Take distributed practice, for example. This tactic involves spreading out your study sessions, rather than engaging in one marathon. Cramming information at the last minute may allow you to get through that test or meeting, but the material will quickly disappear from memory. It's much more effective to dip into the material at intervals over time. And the longer you want to remember the information, whether it's two weeks or two years, the longer the intervals should be.

The second learning strategy that is highly recommended by the report's authors is practice testing. Yes, more tests—but these are not for a grade. Research shows that the mere act of calling information to mind strengthens that knowledge and aids in future retrieval. Both spaced-out learning, or distributed practice, and practice tests were rated as having "high utility" by the authors.

[21] Which of the following best fits in (A)?  
① In place of                      ② In addition to  
③ In contrast to                      ④ On behalf of

[22] Which of the following is NOT true?  
① The authors' list of ineffective learning strategies includes the most popular ones among people.  
② The most effective learning strategies are well known to the general public.  
③ Practice testing aids in future retrieval of the information.  
④ Short-term intensive efforts are less efficient for retaining knowledge than long-term extensive efforts.

[23-25] Read the following passage and answer the questions. (각 3점)

There often are tiny bits of plastic in the fish and shellfish we eat. Scientists are racing to figure out what that means for our health. In a laboratory at Columbia University, Debra Lee Magadini positions a slide under a microscope and flicks on an ultraviolet light. Scrutinizing the liquefied digestive tract of a shrimp she bought at a fish market, she makes a tsk-ing sound. After examining every millimeter of the slide, she exclaims, "( A )!" Inside its gut, seven squiggles of plastic, dyed with Nile red stain, fluoresce.

All over the world, researchers like Magadini are staring through microscopes at tiny pieces of plastic—fibers, fragments, or microbeads—that have made their way into marine and freshwater species, both wild-caught and farmed. Scientists have found microplastics in 114 aquatic species, and more than half of those end up on our dinner plates. Now they are trying to determine what that means for human health.

So far science lacks evidence that microplastics—pieces smaller than one fifth of an inch—are affecting fish at the population level. Our food supply doesn't seem to be under threat—at least as far as we know. But enough research has been done now to show that the fish and shellfish we enjoy are suffering from the omnipresence of this plastic. Every year five million to 14 million tons flow into our oceans from coastal areas. Sunlight, wind, waves, and heat break down that material into smaller bits that look—to plankton, bivalves, fish,

and even whale—a lot like ( B ).

Experiments show that microplastics damage aquatic creatures, as well as turtles and birds: They block digestive tracts, diminish the urge to eat, and alter feeding behavior, all of which reduce growth and reproductive output. Their stomachs stuffed with plastic, some species starve and die.

[23] Which of the following best fits in (A)?  
① This shrimp is fiber city  
② How wonderful a shrimp looks  
③ The shrimp is almost invisible  
④ This shrimp smells good

[24] Which of the following best fits in (B)?  
① fiber                      ② food                      ③ fish                      ④ plastic

[25] Which of the following would be best for the title?  
① Will Fish Evolve into Plastic in Future?  
② Microplastic: The Enemy of Marine Lives  
③ Balancing Plastic and Marine Animals  
④ Mysterious Plastic World under Microscope

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[26]  $f(x) = (3x - 2)^{\sqrt{x}}$  일 때 미분계수  $f'(1)$ 의 값은? (1.7점)

① 0                      ② 1                      ③ 2                      ④ 3

[27] 행렬  $A$ 에 대하여 연립방정식  $Ax = 0$ 의 해집합을  $N_A$ 라고 할 때, 다음 중  $N_A$ 가 직선을 포함하지 않는 행렬  $A$ 는? (1.7점)

- ①  $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & -2 & 2 \\ 3 & -3 & 3 \end{bmatrix}$ 
 ②  $A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 0 \\ 2 & -2 & 2 \end{bmatrix}$
- ③  $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$ 
 ④  $A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

[28] 급수  $\sum_{n=2}^{\infty} \frac{2}{n^2-1}$ 의 합은? (1.7점)

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

[29] 정적분  $\int_0^1 \frac{\sqrt{x}}{x+1} dx$ 의 값은? (1.7점)

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

[30] 다음 중 곡면  $x^2 - xy^2z + z^2 = 1$  위의 점  $(1, 1, 1)$ 에서의 접평면에 속하는 점은? (1.7점)

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

[31] 극좌표계의 점  $(r, \theta) = \left(\frac{3}{2}, \frac{\pi}{3}\right)$ 에서 극곡선  $r = 1 + \cos\theta$ 의 접선의 기울기는? (1.7점)

① 0                      ② -1                      ③  $\frac{1}{4}$                       ④  $-\frac{1}{2}$

[32] 초깃값 문제  $\frac{dy}{dt} = k(y - 7)$ ,  $y(0) = 30$ 에서  $y(3) = 20$ 이 되는  $k$ 의 값은? (2.0점)

①  $\ln\left(\frac{23}{13}\right)$                       ②  $\frac{1}{3}\ln\left(\frac{13}{23}\right)$                       ③  $\frac{1}{3}\ln\left(\frac{23}{13}\right)$                       ④  $\ln\left(\frac{13}{23}\right)$

[33] 초깃값 문제  $y'' - 4y' + 4y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 1$ 에서  $y(2)$ 의 값은? (2.0점)

①  $-e^4$                       ②  $-2e^4$                       ③  $e^4$                       ④  $2e^4$

[34] 극한  $\lim_{x \rightarrow \infty} \left(\sin \frac{2}{x} + \cos \frac{3}{x}\right)^x$ 의 값은? (2.0점)

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

[35]  $n \times n$ 행렬  $A, B$ 에 대하여 다음 중 옳은 것을 모두 고른 것은? (2.0점)

- (가)  $AB$ 가 영행렬이면,  $A$  또는  $B$ 가 영행렬이다.  
 (나)  $AB$ 가 가역행렬이면,  $A$ 와  $B$ 는 모두 가역행렬이다.  
 (다)  $AB$ 가 단위행렬이면,  $BA$ 는 단위행렬이다.

- ① (가), (나)                      ② (가), (다)  
 ③ (나), (다)                      ④ (가), (나), (다)

[36] 행렬  $M = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & 5 & 6 \end{bmatrix}$ 의 고윳값을  $\lambda_1, \lambda_2, \lambda_3$ 라 할 때 고윳값들의 합  $a = \lambda_1 + \lambda_2 + \lambda_3$ 와 고윳값들의 곱  $b = \lambda_1 \lambda_2 \lambda_3$ 는? (2.0점)

①  $a = 6$ ,  $b = 4$                       ②  $a = 6$ ,  $b = 0$   
 ③  $a = 4$ ,  $b = 6$                       ④  $a = 0$ ,  $b = 6$

[37] 구간  $[0, 1]$ 에서 연속인 함수  $f(x)$ 에 대하여 다음 중 옳은 것을 모두 고른 것은? (2.0점)

- (가) 함수  $F(x) = \int_0^x f(t) dt$ 는 구간  $(0, 1)$ 에서 미분가능하다.  
 (나)  $\int_0^1 f(x) dx = 0$ 이면  $f(c) = 0$ 이 되는  $c$ 가 구간  $[0, 1]$ 에 존재한다.  
 (다) 구간  $[0, 1]$ 의 모든  $x$ 에 대하여  $\int_0^x f(t) dt = 0$ 이면, 구간  $[0, 1]$ 의 모든  $x$ 에서  $f(x) = 0$ 이다.

- ① (가), (나)                      ② (가), (다)  
 ③ (나), (다)                      ④ (가), (나), (다)

[38] 공간에서의 온도 함수가  $T(x, y, z) = \pi e^{xy} - \sin(\pi yz)$  일 때, 다음 벡터 중 점  $(0, 1, -1)$ 에서 온도가 가장 빠르게 낮아지는 방향을 나타내는 것은? (2.0점)

- ①  $\langle -1, 1, -1 \rangle$                       ②  $\langle 1, -1, 1 \rangle$
- ③  $\langle 2, 1, -1 \rangle$                       ④  $\langle -2, -1, 1 \rangle$

[39]  $f(x, y) = x^2 + y^3 - 6xy$  일 때 다음 중 옳은 것은? (2.0점)

- ①  $f$ 는  $(0, 0)$ 에서 극댓값을 갖는다.
- ②  $f$ 는  $R^2$ 에서 최댓값을 갖는다.
- ③  $f$ 는  $(18, 6)$ 에서 극솟값을 갖는다.
- ④  $f$ 는  $R^2$ 에서 최솟값을 갖는다.

[40] 곡면  $z = x^2 + y^2$ 과  $2x^2 + y^2 + \frac{3}{2}z^2 = 9$ 가 만나서 이루는 곡선을  $C$ 라 할 때, 다음 중  $C$  위의 점  $(1, -1, 2)$ 에서의 접선에 평행한 벡터는? (2.0점)

- ①  $\langle 3, 4, -1 \rangle$                       ②  $\langle 4, 3, -1 \rangle$
- ③  $\langle 7, 8, -2 \rangle$                       ④  $\langle 8, 7, -2 \rangle$

[41] 다음 특이적분 중 수렴하는 것은? (2.0점)

- ①  $\int_0^\infty \frac{x}{1+x^2} dx$                       ②  $\int_1^\infty \frac{1}{x \ln x} dx$
- ③  $\int_0^1 \ln x dx$                       ④  $\int_1^\infty \frac{1}{x-1} dx$

[42] 이중적분  $\int_0^1 \int_0^{\sqrt{y-y^2}} 1 dx dy$ 의 값은? (2.0점)

- ①  $\pi$                       ②  $\frac{\pi}{2}$                       ③  $\frac{\pi}{4}$                       ④  $\frac{\pi}{8}$

[43] 고정된 양의 실수  $y$ 에 대해 급수  $\sum_{n=0}^\infty a_n y^n$ 이 수렴할 때, 다음 중 옳지 않은 것은? (2.0점)

- ①  $\lim_{n \rightarrow \infty} a_n y^n = 0$ 이다.
- ②  $\sum_{n=0}^\infty a_n (-y)^n$ 은 수렴한다.
- ③  $-y < x < y$  일 때  $\sum_{n=0}^\infty a_n x^n$ 은 수렴한다.
- ④  $-y < x < y$  일 때  $\sum_{n=1}^\infty n a_n x^n$ 은 수렴한다.

[44] 멱급수  $\sum_{n=0}^\infty \frac{(-2)^n x^{2n+1}}{\sqrt{n^2+n+1}}$ 의 수렴반경은? (2.0점)

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

[45]  $f(x) = \int_0^{2x} \frac{1}{\sqrt{1+t^3}} dt$  일 때 극한  $\lim_{h \rightarrow 0} \frac{f(1+3h) - f(1-h)}{h}$ 의 값은? (2.3점)

- ①  $\frac{2}{3}$                       ②  $\frac{4}{3}$                       ③  $\frac{8}{3}$                       ④  $\frac{16}{3}$

[46]  $0 < x < 2$ 에서  $\frac{x}{x-2} = \sum_{n=0}^\infty a_n (x-1)^n$  일 때  $a_7$ 의 값은? (2.3점)

- ①  $-2$                       ②  $0$                       ③  $\frac{1}{7!}$                       ④  $\frac{2}{7!}$

[47]  $f(x) = 1 + x + x^3$  일 때  $\int_1^3 \pi [f^{-1}(y)]^2 dy$ 의 값은? (2.3점)

- ①  $\frac{5}{4}\pi$                       ②  $\frac{10}{4}\pi$                       ③  $\frac{7}{15}\pi$                       ④  $\frac{14}{15}\pi$

[48] 이변수함수  $f(x, y) = x^3 - y^3 + xy + 2x - 4y + 1$ 에 대하여 극한  $\lim_{r \rightarrow 0} \frac{1}{2\pi r} \int_0^{2\pi} f(r \cos \theta, r \sin \theta) \cos \theta d\theta$ 의 값은? (2.3점)

- ①  $-1$                       ②  $1$                       ③  $-2$                       ④  $2$

[49] 삼중적분  $\int_{-1}^1 \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^1 (x^2 + y^2) dz dy dx$ 의 값은? (2.3점)

- ①  $\frac{\pi}{20}$                       ②  $\frac{\pi}{10}$                       ③  $\frac{\pi}{8}$                       ④  $\frac{\pi}{4}$

[50] 다음 이변수함수  $f(x, y)$ 의 이계 편도함수  $f_{xy}(x, y)$ 에 대하여  $f_{xy}(0, 0)$ 의 값은? (2.3점)

$$f(x, y) = \begin{cases} \frac{xy^3}{x^2 + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$$

- ①  $0$                       ②  $1$                       ③  $-1$                       ④  $2$