

자 연 A

20. Which of the following is most likely to be inferred from the passage?
- ① 70 is the new 50 because as life has gotten longer, it has gotten healthier.
 - ② Americans may live longer than their parents.
 - ③ Living too long is an absolute loss.
 - ④ The morbidity is a newly coined term to conceptualize today's life expectancy.
21. Which of the following best describes the organization of the passage?
- ① A critical analysis about the widespread belief of the compression of morbidity
 - ② A description of the compression of morbidity and its impact on aging
 - ③ A historical analysis of aging and health care system in the United States
 - ④ An analysis of the pros and cons of the compression of morbidity
22. Why does the author mention the "compression of morbidity" in the second paragraph?
- ① To provide an in-depth analysis of the American immortal
 - ② To provide a contextualized example of aging and health cares
 - ③ To introduce a worldwide assessment of "healthy life expectancy"
 - ④ To inform medical professionals the importance of regenerative medicine

V. Read the following passage and answer the questions. (23-25)

As discussed above, *Space Sweepers* can be positioned in a transnational mediascape that engages both local and global dimensions. Because the film is set in spaceships and satellites orbiting around Earth, the most visible elements that mark it as Korean are the actors playing the main characters, the predominantly Korean dialogue, the Korean flag on their spaceship, local landmarks in the dystopian cityscape, and such cultural elements as the Korean card game *hwatu*.

In contrast, the presence of non-Korean characters speaking in various languages is the most overt indication of marked transnationality. In *Space Sweepers*, everyone speaks in their native tongue. The sovereign power of nation states seems negligible, but remnants of national identities and cultures survive in the form of language. Most of the dialogue is in Korean, but numerous characters converse in English, Chinese, Russian, Arabic,

French, Danish, Tagalog, and Nigerian pidgin, instead of sharing a common language. Accordingly, the cast comprises actors with diverse national backgrounds. In addition to the British actor Richard Armitage, who plays the main villain, this film features Indian actor Anupam Tripathi (known for his role in *Squid Game*), American actor Kevin Dockry, Mexican actress Carla Fernanda Avilla Escobedo, and many others. *Space Sweepers* thus presents a postnational setting that is portrayed as multicultural and multilingual by having characters from different ethnic groups communicate in various languages thanks to a translation device.

Even though nation-states and cultural differences have become all but obsolete, linguistic differences have somehow survived. This depiction of a _____ environment is meaningful in its rarity – not only in Korean cinema but also in other national cinemas (Another exception is the Chinese science fiction film, *The Wandering Earth*, in which each character speaks their own language). *Space Sweepers* envisions an alternative universe that deviates from future societies depicted in most Hollywood science fiction films that present English as the dominant language of a global future, thereby perpetuating its linguistic and cultural hegemony. Even in films that feature mixed-nationality casting, linguistic homogeneity is retained by having the characters communicate mostly in English, as in *Sunshine* (2007) and *Cloud Atlas* (2012) (The latter includes a few scenes with characters speaking in Korean and a post-apocalyptic form of pidgin English).

23. Which of the following is most likely to be inferred from the passage?
- ① Due to dialogues in various languages, *Space Sweeper* portrays different environment of Sci-fi film from that of Hollywood Sci-fi films.
 - ② The South Korean film could have drawn more attention if they had used more English dialogues spoken by various ethnic castings.
 - ③ Non-Korean characters play smaller roles in the film than other Korean films due to their language barrier resulted from Sci-fi genre convention.
 - ④ The success of *Space Sweepers* could be possible due to developed CGI technology by Korean film industry.

자연 A

24. Which of the following would be the the most appropriate title for the passage?
- ① Multi-ethnic characters in *Space Sweepers*
 - ② English and hegemony of Hollywood films
 - ③ Multilingual environment in postnational space
 - ④ Rising of South Korean Sci-fi films
25. Choose the one that is most suitable for the blank in terms of context at the passage.
- ① multi-ethnic
 - ② polyglot
 - ③ transnational
 - ④ postmodern

수 학 (26-40)

26. 행렬 A 가 3×3 정칙행렬(nonsingular matrix)이고, $\text{adj}A$ 는 행렬 A 의 수반행렬(말림행렬: adjoint matrix)이다. 다음 중 옳은 것을 모두 고르시오. 단, k 는 실수이다.

- (가) $\det(\text{adj}A) = (\det A)^2$
 (나) $\text{adj}(kA) = k \text{adj}(A)$
 (다) $\det(\text{adj}(kA)) = k^6 \det(\text{adj}A)$

- ① (가) ② (나) ③ (가), (나) ④ (가), (다)

27. 다음 중 옳지 않은 것을 고르시오.

- ① 미분방정식 $y'' - 4y' + 4y = x + 1 + e^x$ 의 연계 제차방정식은 e^{2x} 와 xe^{2x} 를 해로 가지고, 주어진 비제차 방정식은 $x + 1 + e^x$ 를 특수해로 가진다.
- ② 미분방정식 $y''' + y'' = 0$ 은 $2x + 3e^{-x}$ 가 해인 상수 계수 선형 제차방정식 중 가장 계수(order)가 낮은 방정식이다.
- ③ 미분방정식 $(1+x)y'' + xy' - y = 0$ 은 $c_1x + c_2e^{-x}$ 를 일반해로 가진다.
- ④ 미분방정식 $y^{(4)} - y'' = 4x$ 는 $y = -\frac{2}{3}(1+x+x^3+e^x+e^{-x})$ 을 하나의 해로 가진다.

28. 적분방정식

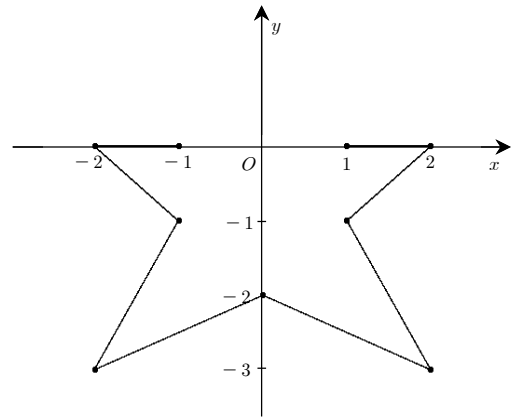
$$f(t) = \frac{1}{2}t - \frac{1}{2} \int_0^t (e^\tau - e^{-\tau})f(t-\tau)d\tau$$

을 만족하는 $f(t)$ 에 대해서 $f(1)$ 의 값을 구하시오.

- ① $\frac{3}{12}$ ② $\frac{5}{12}$ ③ $\frac{7}{12}$ ④ $\frac{11}{12}$

29. 점 $(-1, 0)$ 에서 시작하여, $(-2, 0)$, $(-1, -1)$, $(-2, -3)$, $(0, -2)$, $(2, -3)$, $(1, -1)$, $(2, 0)$, $(1, 0)$ 까지를 선분으로 차례로 잇는 경로 C 에 대해,

$\int_C \frac{-ydx + xdy}{x^2 + y^2}$ 을 구하시오.



- ① 0 ② $\frac{\pi}{2}$ ③ π ④ 2π

30. 곡면 S 는 원뿔면 $z = \sqrt{x^2 + y^2}$ 과 평면 $z = 1$ 로 둘러싸인 입체의 표면이다. 벡터장 $\mathbf{F} = xy^2\mathbf{i} + y^3\mathbf{j} + y^2z\mathbf{k}$ 의 곡면 S 의 바깥 방향으로의 유량(flux) $\iint_S \mathbf{F} \cdot \mathbf{n} dS$ 와 같은 것을 고르시오.

- ① $\int_0^{2\pi} \sin^2\theta d\theta \int_0^1 (5r^3 - 5r^4) dr$
- ② $\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_0^{\sec\phi} 5\rho^2 \sin^2\phi \sin^2\theta d\rho d\phi d\theta$
- ③ $\int_{-1}^1 \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^1 (xy^2 + y^3 + y^2z) dz dy dx$
- ④ $\frac{\pi}{8}$

자연 A

31. 극좌표에서 곡선 $r^2 = \cos 2\theta$ 의 외부이면서 곡선 $r = 2\cos\theta$ 의 내부인 영역의 면적을 구하시오.

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

32. 다음 3개의 무한급수 중 수렴하는 급수의 개수를 구하시오.

(가) $\sum_{n=1}^{\infty} \left(\frac{n}{n+1}\right)^n$

(나) $\sum_{n=2}^{\infty} \left(\frac{\ln n}{n^2} + \frac{1}{n(\ln n)^2}\right)$

(다) $\sum_{n=1}^{\infty} \left(\frac{(-1)^n}{\cosh n} + \frac{\sin n}{n\sqrt{n}}\right)$

- ① 0개 ② 1개 ③ 2개 ④ 3개

33. $f(x) = \int_0^x e^{-t^2} dt$ 일 때, $f^{(23)}(0)$ 의 값을 구하시오.

- ① 0 ② $-\frac{22!}{11!}$ ③ $\frac{23!}{11!}$ ④ $-\frac{23!}{11!}$

34. $f(x) = x^{\cos x}$, $x > 0$ 일 때 $x = \frac{\pi}{2}$ 에서의 도함수의 값

$f'\left(\frac{\pi}{2}\right)$ 를 구하시오.

- ① $\ln 2 - \ln \pi$ ② $\ln \pi - \ln 2$ ③ $\ln \pi + \ln 2$ ④ $-\ln \pi - \ln 2$

35. $x \geq 1$ 에서 정의된 함수 $f(x)$ 가 $f(1) = 1$ 이고

$f'(x) = \frac{1}{x^2 + (f(x))^2}$ 을 만족할 때, 다음 $f(x)$ 의 성질 중 옳은 것의 개수를 구하시오.

(가) $f'(x) \leq \frac{1}{1+x^2}$ 을 만족한다

(나) $f(x) = 1 + \int_1^x f'(t)dt$ 이다

(다) $\lim_{x \rightarrow \infty} f(x) \leq 1 + \frac{\pi}{4}$ 이다

- ① 0개 ② 1개 ③ 2개 ④ 3개

36. 다음 중 적분의 계산이 잘못된 것을 고르시오.

① $\int_1^2 (\ln x)^2 dx = 2(\ln 2)^2 - 4\ln 2 + 2$

② $\int_0^{\infty} x^5 e^{-x} dx = 120$

③ $\int_0^3 \frac{1}{(x-1)^2} dx = -\frac{3}{2}$

④ $\int_0^{\frac{\pi^2}{4}} \sin \sqrt{x} dx = 2$

37. 곡선 $y = \cosh x$, $0 \leq x \leq 1$ 을 x 축을 중심으로 회전하여 얻은 곡면의 면적을 구하시오.

① $2\pi \sinh 1$ ② $\frac{\pi}{2}(e^2 - e^{-2} + 4)$

③ $\pi(e - e^{-1})$ ④ $\pi\left(\frac{\sinh 2}{2} + 1\right)$

38. R 이 $y = x$, $y = 3x$, $xy = 1$, $xy = 3$ 을 경계로 하는

제1사분면의 영역일 때, 이중적분 $\iint_R xy dA$ 를 구하시오.

- ① $2\ln 2$ ② $2\ln 3$ ③ $3\ln 2$ ④ $4\ln 3$

자 연 A

39. 윗변과 아랫변의 온도가 0, 왼쪽 변과 오른쪽 변의 온도가 처음에 주어진 대로 유지되는 직사각형 판의 각 점에서 평형 상태의 온도 $u(x, y)$ 는 다음과 같이 주어진다.

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, \quad 0 < x < a, \quad 0 < y < b$$

$$u(x, 0) = 0, \quad u(x, b) = 0, \quad 0 < x < a$$

$$u(0, y) = F(y), \quad u(a, y) = G(y), \quad 0 < y < b$$

이를 만족하는 해의 형태는

$$u(x, y) = \sum_{n=1}^{\infty} \left(A_n \cosh \frac{n\pi x}{b} + B_n \sinh \frac{n\pi x}{b} \right) \sin \frac{n\pi y}{b} \text{이다.}$$

다음 중 옳지 않은 것을 고르시오.

- ① $A_n = \frac{2}{b} \int_0^b F(y) \sin \frac{n\pi y}{b} dy$
- ② $F(y) = \sin \frac{3\pi y}{b}$ 이면 $A_3 = 1$ 이고 $n \neq 3$ 에 대해 $A_n = 0$ 이다.
- ③ $G(y) = 0$ 이면 모든 n 에 대해 $B_n = 0$ 이다.
- ④ $F(y) = 0, G(y) = \sin \frac{3\pi y}{b}$ 이면 $B_3 = \frac{1}{\sinh \frac{3\pi a}{b}}$ 이고 $n \neq 3$ 에 대해 $B_n = 0$ 이다.

40. (가)~(다) 중 변수 치환에 의해 식이 옳게 변형된 것의 개수를 구하시오.

(가) $x = e^t$ 에 의해 $ax^2 \frac{d^2 y}{dx^2} + bx \frac{dy}{dx} + cy = 0$ 은

$$a \frac{d^2 y}{dt^2} + (b-a) \frac{dy}{dt} + cy = 0 \text{으로 변형}$$

(단, a, b, c 는 상수)

(나) $x = r \cos \theta, y = r \sin \theta$ 에 의해 $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ 은

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0 \text{으로 변형}$$

(다) $\xi = x + at, \eta = x - at$ 에 의해 $a^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ 은

$$\frac{\partial^2 u}{\partial \eta \partial \xi} = 0 \text{으로 변형 (단, } a \neq 0)$$

- ① 0개 ② 1개 ③ 2개 ④ 3개