2025 IUT 1st Admission Test(SBL)

Math Examination(TYPE A)

< Multiple choice Types > There is only one correct answer for each question. Mark your choice on the OMR answer sheet.

○ The points for each question are listed next to the question number.

○ You can use the right side of each page for your memo.

1. [3 points]
Compute $\sqrt{4+\sqrt{12}}-\sqrt{4-\sqrt{12}}$.

① 1 ② 2 ③ $\sqrt{2}$ ④ 3 ⑤ $\sqrt{3}$

2. [3 points]
When $\alpha^2+\frac{4}{\alpha^2}=29$ for a real number $\alpha>2$, find $\alpha^3-\frac{8}{\alpha^3}$.

① 151 ② 153 ③ 155 ④ 157 ⑤ 159

3. [3 points]
Compute $\sum_{n=1}^{100}\frac{1}{n^2+3n+2}$.

① $\frac{13}{51}$ ② $\frac{16}{51}$ ③ $\frac{19}{51}$ ④ $\frac{22}{51}$ ⑤ $\frac{25}{51}$

4. [3 points]
When α, β, γ are the solutions of $x^3-2x^2-4x+4=0$, find $\alpha^2\beta^2+\beta^2\gamma^2+\gamma^2\alpha^2$.

① 32 ② 34 ③ 36 ④ 38 ⑤ 40

5. [3 points]
Compute $\log_{\sqrt{2}}9+\log_9 125\times\log_5 27+\log_{\frac{1}{2}}81$.

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

6. [3 points]
When $40^x=2$ and $25^y=16$, find $\frac{1}{x}-\frac{2}{y}$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

7. [3 points]
When $A=\begin{pmatrix}1&2\\3&4\end{pmatrix}$, $B=\begin{pmatrix}2&-1\\3&-2\end{pmatrix}$ and $(A-B)B^{-1}=\begin{pmatrix}a&b\\c&d\end{pmatrix}$, find $a+b+c+d$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

8. [3 points]
When $A=\begin{pmatrix}1&0\\3&-1\end{pmatrix}$, $B=\begin{pmatrix}2&-3\\-1&1\end{pmatrix}$ and $A^{-1}(A+B)B^{-1}=\begin{pmatrix}a&b\\c&d\end{pmatrix}$, find $a+b+c+d$.

① 0 ② -2 ③ -4 ④ -6 ⑤ -8

9. [3 points]
When $x^2+3x-1=0$ and $x>0$, find $x^4-\frac{1}{x^4}$.

① $-31\sqrt{13}$ ② $-33\sqrt{13}$ ③ $-35\sqrt{13}$
④ $-37\sqrt{13}$ ⑤ $-39\sqrt{13}$

10. [3 points]
When a, b are the solutions of $9^x - 7 \cdot 3^x + 10 = 0$, find $9^a + 9^b$.
① 21 ② 23 ③ 25 ④ 27 ⑤ 29

11. [3 points]
When $2^{a+b} = 6$ and $a - b = \log_2 3$, find $4^a + 2b$.
① 11 ② 13 ③ 15 ④ 17 ⑤ 19

12. [3 points]
When $f(x) = 16^x - 4^{x+2} + 60$ attains the minimum value a at $x = b$, find $a + b$.
① $-\frac{1}{2}$ ② $-\frac{3}{2}$ ③ $-\frac{5}{2}$ ④ $-\frac{7}{2}$ ⑤ $-\frac{9}{2}$

13. [3 points]
Compute $\left(\frac{-1+\sqrt{3}\,i}{1+i}\right)^6$.
① $2i$ ② $4i$ ③ $6i$ ④ $8i$ ⑤ $10i$

14. [3 points]
When $x = \frac{\sqrt{6}-\sqrt{2}\,i}{\sqrt{6}+\sqrt{2}\,i}$ and $y = \frac{\sqrt{6}+\sqrt{2}\,i}{\sqrt{6}-\sqrt{2}\,i}$, find $x^3 + y^3$.
① -2 ② -4 ③ -6 ④ -8 ⑤ -10

15. [3 points]
Find $\sin\frac{\pi}{12} + \cos\frac{\pi}{12}$.
① $\sqrt{2}$ ② $\sqrt{3}$ ③ $\frac{\sqrt{6}}{2}$
④ $\frac{\sqrt{2}+\sqrt{3}}{2}$ ⑤ $\frac{\sqrt{2}+\sqrt{6}}{3}$

16. [3 points]
When the solutions of $3x^2 - ax + 1 = 0$ are $\sin\theta$ and $\cos\theta$ for $0 \le \theta \le \frac{\pi}{2}$, find a.
① $\sqrt{2}$ ② $2\sqrt{2}$ ③ $2\sqrt{3}$ ④ $\sqrt{15}$ ⑤ $3\sqrt{2}$

17. [3 points]
When $4\sin^2\frac{x}{2} - 1 = \cos 2x$, find $\cos x$.
① $\frac{\sqrt{5}-1}{\sqrt{2}}$ ② $\frac{\sqrt{5}-1}{2}$ ③ $\frac{\sqrt{5}-1}{\sqrt{3}}$
④ $\frac{\sqrt{5}-1}{3}$ ⑤ $\frac{\sqrt{5}-1}{\sqrt{6}}$

18. [3 points]
Find $\sin\frac{3\pi}{8}$.
① $\frac{\sqrt{2+\sqrt{2}}}{2}$ ② $\frac{\sqrt{2+\sqrt{2}}}{3}$ ③ $\frac{\sqrt{2+\sqrt{2}}}{4}$
④ $\frac{\sqrt{2+\sqrt{2}}}{6}$ ⑤ $\frac{\sqrt{2+\sqrt{2}}}{8}$

19. [3 points]
Find the solution of
$\sqrt{3}\cos x - \sin x = \sqrt{2}$, $(0 \le x \le \frac{\pi}{2})$.
① $\frac{\pi}{12}$ ② $\frac{\pi}{9}$ ③ $\frac{5\pi}{12}$ ④ $\frac{4\pi}{9}$ ⑤ $\frac{7\pi}{12}$

20. [3 points]
When $y = ax + b$ is the tangent line to $f(x) = x^6 + x^5 + 3x + 6$ at $x = -1$, find $a + b$.
① 1 ② 3 ③ 5 ④ 7 ⑤ 9

21. [4 points]
Find $\lim_{x\to\infty}\left(\sqrt{2x+3\sqrt{x}+1} - \sqrt{2x+5}\right)$.
① $3\sqrt{2}$ ② $\frac{3\sqrt{2}}{2}$ ③ $\frac{3\sqrt{2}}{4}$ ④ $\frac{\sqrt{2}}{2}$ ⑤ $\frac{3\sqrt{2}}{8}$

22. [4 points]
When $f(x) = (2x + \sqrt{x} - 4)^2$, find $f'(4)$.
① 21 ② 23 ③ 25 ④ 27 ⑤ 29

23. [4 points]
When M and m are the maximum and minimum values of $f(x)=\frac{1}{3}x^3-x^2+4$ for $0\le x\le 4$, find $M+m$.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

24. [4 points]
Find the minimum value of
$f(x)=\cos^3 x-\frac{1}{2}\cos 2x+\frac{3}{2}$, $0\le x\le\frac{\pi}{2}$.

① $\frac{42}{27}$ ② $\frac{44}{27}$ ③ $\frac{46}{27}$ ④ $\frac{47}{27}$ ⑤ $\frac{50}{27}$

25. [4 points]
Find the shortest distance from $(0, 0)$ to the curve $3xy=1$.

① $\frac{2}{3}$ ② $\frac{\sqrt{2}}{3}$ ③ $\frac{\sqrt{6}}{3}$ ④ $\frac{2\sqrt{2}}{3}$ ⑤ $\frac{4}{3}$

26. [4 points]
Find $\lim_{x\to 0}\frac{\sin^2 3x}{1-\cos 2x}$.

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

27. [4 points]
Compute $\int_0^1 (2x^2-1)^2\,dx$.

① $\frac{4}{15}$ ② $\frac{7}{15}$ ③ $\frac{8}{15}$ ④ $\frac{11}{15}$ ⑤ $\frac{13}{15}$

28. [4 points]
Find $\int_0^2 \frac{x}{(x+2)^3}\,dx$.

① $\frac{1}{2}$ ② $\frac{1}{4}$ ③ $\frac{1}{8}$ ④ $\frac{1}{12}$ ⑤ $\frac{1}{16}$

29. [4 points]
Find the area of the region enclosed by $y=x^2-2$ and $y=2x+1$.

① $\frac{32}{3}$ ② $\frac{34}{3}$ ③ 12 ④ $\frac{38}{3}$ ⑤ $\frac{40}{3}$

30. [4 points]
When a function $f(x)$ satisfies $f(x)=x^4+\int_0^1 t f(t)\,dt$, find $\int_0^1 f(x)\,dx$.

① $\frac{2}{15}$ ② $\frac{4}{15}$ ③ $\frac{7}{15}$ ④ $\frac{8}{15}$ ⑤ $\frac{11}{15}$

2025 IUT 1st Admission Test(SBL)

Math Examination(TYPE B)

< Multiple choice Types > There is only one correct answer for each question. Mark your choice on the OMR answer sheet.

○ The points for each question are listed next to the question number.

○ You can use the right side of each page for your memo.

1. [3 points]
Compute $\log_{\sqrt{2}} 9 + \log_9 125 \times \log_5 27 + \log_{\frac{1}{2}} 81$.

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

2. [3 points]
Compute $\sqrt{4+\sqrt{12}} - \sqrt{4-\sqrt{12}}$.

① 1 ② 2 ③ $\sqrt{2}$ ④ 3 ⑤ $\sqrt{3}$

3. [3 points]
When $\alpha^2 + \frac{4}{\alpha^2} = 29$ for a real number $\alpha > 2$, find $\alpha^3 - \frac{8}{\alpha^3}$.

① 151 ② 153 ③ 155 ④ 157 ⑤ 159

4. [3 points]
Compute $\sum_{n=1}^{100} \frac{1}{n^2+3n+2}$.

① $\frac{13}{51}$ ② $\frac{16}{51}$ ③ $\frac{19}{51}$ ④ $\frac{22}{51}$ ⑤ $\frac{25}{51}$

5. [3 points]
When α, β, γ are the solutions of $x^3 - 2x^2 - 4x + 4 = 0$, find $\alpha^2\beta^2 + \beta^2\gamma^2 + \gamma^2\alpha^2$.

① 32 ② 34 ③ 36 ④ 38 ⑤ 40

6. [3 points]
When a, b are the solutions of $9^x - 7 \cdot 3^x + 10 = 0$, find $9^a + 9^b$.

① 21 ② 23 ③ 25 ④ 27 ⑤ 29

7. [3 points]
When $40^x = 2$ and $25^y = 16$, find $\frac{1}{x} - \frac{2}{y}$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

8. [3 points]
When $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix}$ and $(A-B)B^{-1} = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, find $a+b+c+d$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

9. [3 points]
When $A = \begin{pmatrix} 1 & 0 \\ 3 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -3 \\ -1 & 1 \end{pmatrix}$ and $A^{-1}(A+B)B^{-1} = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, find $a+b+c+d$.

① 0 ② -2 ③ -4 ④ -6 ⑤ -8

10. [3 points]
When $x^2 + 3x - 1 = 0$ and $x > 0$, find $x^4 - \frac{1}{x^4}$.

① $-31\sqrt{13}$ ② $-33\sqrt{13}$ ③ $-35\sqrt{13}$
④ $-37\sqrt{13}$ ⑤ $-39\sqrt{13}$

11. [3 points]
Find $\sin\frac{\pi}{12} + \cos\frac{\pi}{12}$.

① $\sqrt{2}$ ② $\sqrt{3}$ ③ $\frac{\sqrt{6}}{2}$
④ $\frac{\sqrt{2}+\sqrt{3}}{2}$ ⑤ $\frac{\sqrt{2}+\sqrt{6}}{3}$

12. [3 points]
When $2^{a+b}=6$ and $a-b=\log_2 3$, find 4^a+2b.
① 11 ② 13 ③ 15 ④ 17 ⑤ 19

13. [3 points]
When $f(x)=16^x-4^{x+2}+60$ attains the minimum value a at $x=b$, find $a+b$.
① $-\frac{1}{2}$ ② $-\frac{3}{2}$ ③ $-\frac{5}{2}$ ④ $-\frac{7}{2}$ ⑤ $-\frac{9}{2}$

14. [3 points]
Compute $\left(\frac{-1+\sqrt{3}\,i}{1+i}\right)^6$.
① $2i$ ② $4i$ ③ $6i$ ④ $8i$ ⑤ $10i$

15. [3 points]
When $x=\frac{\sqrt{6}-\sqrt{2}\,i}{\sqrt{6}+\sqrt{2}\,i}$ and $y=\frac{\sqrt{6}+\sqrt{2}\,i}{\sqrt{6}-\sqrt{2}\,i}$, find x^3+y^3.
① -2 ② -4 ③ -6 ④ -8 ⑤ -10

16. [3 points]
When $y=ax+b$ is the tangent line to $f(x)=x^6+x^5+3x+6$ at $x=-1$, find $a+b$.
① 1 ② 3 ③ 5 ④ 7 ⑤ 9

17. [3 points]
When the solutions of $3x^2-ax+1=0$ are $\sin\theta$ and $\cos\theta$ for $0\le\theta\le\frac{\pi}{2}$, find a.
① $\sqrt{2}$ ② $2\sqrt{2}$ ③ $2\sqrt{3}$ ④ $\sqrt{15}$ ⑤ $3\sqrt{2}$

18. [3 points]
When $4\sin^2\frac{x}{2}-1=\cos 2x$, find $\cos x$.
① $\frac{\sqrt{5}-1}{\sqrt{2}}$ ② $\frac{\sqrt{5}-1}{2}$ ③ $\frac{\sqrt{5}-1}{\sqrt{3}}$
④ $\frac{\sqrt{5}-1}{3}$ ⑤ $\frac{\sqrt{5}-1}{\sqrt{6}}$

19. [3 points]
Find $\sin\frac{3\pi}{8}$.
① $\frac{\sqrt{2+\sqrt{2}}}{2}$ ② $\frac{\sqrt{2+\sqrt{2}}}{3}$ ③ $\frac{\sqrt{2+\sqrt{2}}}{4}$
④ $\frac{\sqrt{2+\sqrt{2}}}{6}$ ⑤ $\frac{\sqrt{2+\sqrt{2}}}{8}$

20. [3 points]
Find the solution of
$\sqrt{3}\cos x-\sin x=\sqrt{2}$, $(0\le x\le\frac{\pi}{2})$.
① $\frac{\pi}{12}$ ② $\frac{\pi}{9}$ ③ $\frac{5\pi}{12}$ ④ $\frac{4\pi}{9}$ ⑤ $\frac{7\pi}{12}$

21. [4 points]
Find the shortest distance from $(0,0)$ to the curve $3xy=1$.
① $\frac{2}{3}$ ② $\frac{\sqrt{2}}{3}$ ③ $\frac{\sqrt{6}}{3}$ ④ $\frac{2\sqrt{2}}{3}$ ⑤ $\frac{4}{3}$

22. [4 points]
Find $\lim_{x\to\infty}\left(\sqrt{2x+3\sqrt{x}+1}-\sqrt{2x+5}\right)$.
① $3\sqrt{2}$ ② $\frac{3\sqrt{2}}{2}$ ③ $\frac{3\sqrt{2}}{4}$ ④ $\frac{\sqrt{2}}{2}$ ⑤ $\frac{3\sqrt{2}}{8}$

23. [4 points]
When $f(x)=(2x+\sqrt{x}-4)^2$, find $f'(4)$.
① 21 ② 23 ③ 25 ④ 27 ⑤ 29

24. [4 points]
When M and m are the maximum and minimum values of $f(x)=\frac{1}{3}x^3-x^2+4$ for $0\le x\le 4$, find $M+m$.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

25. [4 points]
Find the minimum value of
$f(x)=\cos^3 x-\frac{1}{2}\cos 2x+\frac{3}{2}$, $0\le x\le\frac{\pi}{2}$.

① $\frac{42}{27}$ ② $\frac{44}{27}$ ③ $\frac{46}{27}$ ④ $\frac{47}{27}$ ⑤ $\frac{50}{27}$

26. [4 points]
When a function $f(x)$ satisfies
$f(x)=x^4+\int_0^1 t f(t)\,dt$, find $\int_0^1 f(x)\,dx$.

① $\frac{2}{15}$ ② $\frac{4}{15}$ ③ $\frac{7}{15}$ ④ $\frac{8}{15}$ ⑤ $\frac{11}{15}$

27. [4 points]
Find $\lim_{x\to 0}\frac{\sin^2 3x}{1-\cos 2x}$.

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

28. [4 points]
Compute $\int_0^1 (2x^2-1)^2\,dx$.

① $\frac{4}{15}$ ② $\frac{7}{15}$ ③ $\frac{8}{15}$ ④ $\frac{11}{15}$ ⑤ $\frac{13}{15}$

29. [4 points]
Find $\int_0^2 \frac{x}{(x+2)^3}\,dx$.

① $\frac{1}{2}$ ② $\frac{1}{4}$ ③ $\frac{1}{8}$ ④ $\frac{1}{12}$ ⑤ $\frac{1}{16}$

30. [4 points]
Find the area of the region enclosed by $y=x^2-2$ and $y=2x+1$.

① $\frac{32}{3}$ ② $\frac{34}{3}$ ③ 12 ④ $\frac{38}{3}$ ⑤ $\frac{40}{3}$

2025 IUT 1st Admission Test(SBL)

Math Examination(TYPE C)

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1. [3 points]
When α, β, γ are the solutions of $x^3-2x^2-4x+4=0$, find $\alpha^2\beta^2+\beta^2\gamma^2+\gamma^2\alpha^2$.

① 32 ② 34 ③ 36 ④ 38 ⑤ 40

2. [3 points]
Compute $\log_{\sqrt{2}}9+\log_9 125\times\log_5 27+\log_{\frac{1}{2}}81$.

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

3. [3 points]
Compute $\sqrt{4+\sqrt{12}}-\sqrt{4-\sqrt{12}}$.

① 1 ② 2 ③ $\sqrt{2}$ ④ 3 ⑤ $\sqrt{3}$

4. [3 points]
When $\alpha^2+\frac{4}{\alpha^2}=29$ for a real number $\alpha>2$, find $\alpha^3-\frac{8}{\alpha^3}$.

① 151 ② 153 ③ 155 ④ 157 ⑤ 159

5. [3 points]
Compute $\sum_{n=1}^{100}\frac{1}{n^2+3n+2}$.

① $\frac{13}{51}$ ② $\frac{16}{51}$ ③ $\frac{19}{51}$ ④ $\frac{22}{51}$ ⑤ $\frac{25}{51}$

6. [3 points]
When $x^2+3x-1=0$ and $x>0$, find $x^4-\frac{1}{x^4}$.

① $-31\sqrt{13}$ ② $-33\sqrt{13}$ ③ $-35\sqrt{13}$
④ $-37\sqrt{13}$ ⑤ $-39\sqrt{13}$

7. [3 points]
When a, b are the solutions of $9^x-7\cdot 3^x+10=0$, find 9^a+9^b.

① 21 ② 23 ③ 25 ④ 27 ⑤ 29

8. [3 points]
When $40^x=2$ and $25^y=16$, find $\frac{1}{x}-\frac{2}{y}$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

9. [3 points]
When $A=\begin{pmatrix}1&2\\3&4\end{pmatrix}$, $B=\begin{pmatrix}2&-1\\3&-2\end{pmatrix}$ and $(A-B)B^{-1}=\begin{pmatrix}a&b\\c&d\end{pmatrix}$, find $a+b+c+d$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

10. [3 points]
When $A=\begin{pmatrix}1&0\\3&-1\end{pmatrix}$, $B=\begin{pmatrix}2&-3\\-1&1\end{pmatrix}$ and $A^{-1}(A+B)B^{-1}=\begin{pmatrix}a&b\\c&d\end{pmatrix}$, find $a+b+c+d$.

① 0 ② -2 ③ -4 ④ -6 ⑤ -8

11. [3 points]

When $x = \dfrac{\sqrt{6}-\sqrt{2}\,i}{\sqrt{6}+\sqrt{2}\,i}$ and $y = \dfrac{\sqrt{6}+\sqrt{2}\,i}{\sqrt{6}-\sqrt{2}\,i}$, find x^3+y^3.

① -2 ② -4 ③ -6 ④ -8 ⑤ -10

12. [3 points]

Find $\sin\dfrac{\pi}{12}+\cos\dfrac{\pi}{12}$.

① $\sqrt{2}$ ② $\sqrt{3}$ ③ $\dfrac{\sqrt{6}}{2}$

④ $\dfrac{\sqrt{2}+\sqrt{3}}{2}$ ⑤ $\dfrac{\sqrt{2}+\sqrt{6}}{3}$

13. [3 points]

When $2^{a+b}=6$ and $a-b=\log_2 3$, find 4^a+2b.

① 11 ② 13 ③ 15 ④ 17 ⑤ 19

14. [3 points]

When $f(x)=16^x-4^{x+2}+60$ attains the minimum value a at $x=b$, find $a+b$.

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

15. [3 points]

Compute $\left(\dfrac{-1+\sqrt{3}\,i}{1+i}\right)^6$.

① $2i$ ② $4i$ ③ $6i$ ④ $8i$ ⑤ $10i$

16. [3 points]

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$\sqrt{3}\cos x-\sin x=\sqrt{2}$, $(0\le x\le\dfrac{\pi}{2})$.

① $\dfrac{\pi}{12}$ ② $\dfrac{\pi}{9}$ ③ $\dfrac{5\pi}{12}$ ④ $\dfrac{4\pi}{9}$ ⑤ $\dfrac{7\pi}{12}$

17. [3 points]

When $y=ax+b$ is the tangent line to $f(x)=x^6+x^5+3x+6$ at $x=-1$, find $a+b$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

18. [3 points]

When the solutions of $3x^2-ax+1=0$ are $\sin\theta$ and $\cos\theta$ for $0\le\theta\le\dfrac{\pi}{2}$, find a.

① $\sqrt{2}$ ② $2\sqrt{2}$ ③ $2\sqrt{3}$ ④ $\sqrt{15}$ ⑤ $3\sqrt{2}$

19. [3 points]

When $4\sin^2\dfrac{x}{2}-1=\cos 2x$, find $\cos x$.

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

④ $\dfrac{\sqrt{5}-1}{3}$ ⑤ $\dfrac{\sqrt{5}-1}{\sqrt{6}}$

20. [3 points]

Find $\sin\dfrac{3\pi}{8}$.

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

④ $\dfrac{\sqrt{2+\sqrt{2}}}{6}$ ⑤ $\dfrac{\sqrt{2+\sqrt{2}}}{8}$

21. [4 points]

Find the minimum value of

$f(x)=\cos^3 x-\dfrac{1}{2}\cos 2x+\dfrac{3}{2}$, $0\le x\le\dfrac{\pi}{2}$.

① $\dfrac{42}{27}$ ② $\dfrac{44}{27}$ ③ $\dfrac{46}{27}$ ④ $\dfrac{47}{27}$ ⑤ $\dfrac{50}{27}$

22. [4 points]

Find the shortest distance from $(0,0)$ to the curve $3xy=1$.

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

23. [4 points]
Find $\lim_{x\to\infty}\left(\sqrt{2x+3\sqrt{x}+1}\ -\ \sqrt{2x+5}\right)$.

① $3\sqrt{2}$ ② $\frac{3\sqrt{2}}{2}$ ③ $\frac{3\sqrt{2}}{4}$ ④ $\frac{\sqrt{2}}{2}$ ⑤ $\frac{3\sqrt{2}}{8}$

24. [4 points]
When $f(x)=(2x+\sqrt{x}-4)^2$, find $f'(4)$.

① 21 ② 23 ③ 25 ④ 27 ⑤ 29

25. [4 points]
When M and m are the maximum and minimum values of $f(x)=\frac{1}{3}x^3-x^2+4$ for $0\le x\le 4$, find $M+m$.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

26. [4 points]
Find the area of the region enclosed by $y=x^2-2$ and $y=2x+1$.

① $\frac{32}{3}$ ② $\frac{34}{3}$ ③ 12 ④ $\frac{38}{3}$ ⑤ $\frac{40}{3}$

27. [4 points]
When a function $f(x)$ satisfies $f(x)=x^4+\int_0^1 tf(t)\,dt$, find $\int_0^1 f(x)\,dx$.

① $\frac{2}{15}$ ② $\frac{4}{15}$ ③ $\frac{7}{15}$ ④ $\frac{8}{15}$ ⑤ $\frac{11}{15}$

28. [4 points]
Find $\lim_{x\to 0}\frac{\sin^2 3x}{1-\cos 2x}$.

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

29. [4 points]
Compute $\int_0^1 (2x^2-1)^2\,dx$.

① $\frac{4}{15}$ ② $\frac{7}{15}$ ③ $\frac{8}{15}$ ④ $\frac{11}{15}$ ⑤ $\frac{13}{15}$

30. [4 points]
Find $\int_0^2 \frac{x}{(x+2)^3}\,dx$.

① $\frac{1}{2}$ ② $\frac{1}{4}$ ③ $\frac{1}{8}$ ④ $\frac{1}{12}$ ⑤ $\frac{1}{16}$

2025 IUT 1st Admission Test(SBL)

Math Examination(TYPE D)

< Multiple choice Types > There is only one correct answer for each question. Mark your choice on the OMR answer sheet.

○ The points for each question are listed next to the question number.

○ You can use the right side of each page for your memo.

1. [3 points]

Compute $\sum_{n=1}^{100} \frac{1}{n^2+3n+2}$.

① $\frac{13}{51}$ ② $\frac{16}{51}$ ③ $\frac{19}{51}$ ④ $\frac{22}{51}$ ⑤ $\frac{25}{51}$

2. [3 points]

When α, β, γ are the solutions of $x^3-2x^2-4x+4=0$, find $\alpha^2\beta^2+\beta^2\gamma^2+\gamma^2\alpha^2$.

① 32 ② 34 ③ 36 ④ 38 ⑤ 40

3. [3 points]

Compute $\log_{\sqrt{2}} 9 + \log_9 125 \times \log_5 27 + \log_{\frac{1}{2}} 81$.

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

4. [3 points]

Compute $\sqrt{4+\sqrt{12}} - \sqrt{4-\sqrt{12}}$.

① 1 ② 2 ③ $\sqrt{2}$ ④ 3 ⑤ $\sqrt{3}$

5. [3 points]

When $\alpha^2+\frac{4}{\alpha^2}=29$ for a real number $\alpha>2$, find $\alpha^3-\frac{8}{\alpha^3}$.

① 151 ② 153 ③ 155 ④ 157 ⑤ 159

6. [3 points]

When $A=\begin{pmatrix}1 & 0\\ 3 & -1\end{pmatrix}$, $B=\begin{pmatrix}2 & -3\\ -1 & 1\end{pmatrix}$ and $A^{-1}(A+B)B^{-1}=\begin{pmatrix}a & b\\ c & d\end{pmatrix}$, find $a+b+c+d$.

① 0 ② -2 ③ -4 ④ -6 ⑤ -8

7. [3 points]

When $x^2+3x-1=0$ and $x>0$, find $x^4-\frac{1}{x^4}$.

① $-31\sqrt{13}$ ② $-33\sqrt{13}$ ③ $-35\sqrt{13}$
④ $-37\sqrt{13}$ ⑤ $-39\sqrt{13}$

8. [3 points]

When a, b are the solutions of $9^x-7\cdot 3^x+10=0$, find 9^a+9^b.

① 21 ② 23 ③ 25 ④ 27 ⑤ 29

9. [3 points]

When $40^x=2$ and $25^y=16$, find $\frac{1}{x}-\frac{2}{y}$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

10. [3 points]

When $A=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}$, $B=\begin{pmatrix}2 & -1\\ 3 & -2\end{pmatrix}$ and $(A-B)B^{-1}=\begin{pmatrix}a & b\\ c & d\end{pmatrix}$, find $a+b+c+d$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

11. [3 points]

Compute $\left(\dfrac{-1+\sqrt{3}\,i}{1+i}\right)^6$.

① $2i$ ② $4i$ ③ $6i$ ④ $8i$ ⑤ $10i$

12. [3 points]

When $x=\dfrac{\sqrt{6}-\sqrt{2}\,i}{\sqrt{6}+\sqrt{2}\,i}$ and $y=\dfrac{\sqrt{6}+\sqrt{2}\,i}{\sqrt{6}-\sqrt{2}\,i}$, find x^3+y^3.

① -2 ② -4 ③ -6 ④ -8 ⑤ -10

13. [3 points]

Find $\sin\dfrac{\pi}{12}+\cos\dfrac{\pi}{12}$.

① $\sqrt{2}$ ② $\sqrt{3}$ ③ $\dfrac{\sqrt{6}}{2}$

④ $\dfrac{\sqrt{2}+\sqrt{3}}{2}$ ⑤ $\dfrac{\sqrt{2}+\sqrt{6}}{3}$

14. [3 points]

When $2^{a+b}=6$ and $a-b=\log_2 3$, find 4^a+2b.

① 11 ② 13 ③ 15 ④ 17 ⑤ 19

15. [3 points]

When $f(x)=16^x-4^{x+2}+60$ attains the minimum value a at $x=b$, find $a+b$.

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

16. [3 points]

Find $\sin\dfrac{3\pi}{8}$.

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

④ $\dfrac{\sqrt{2+\sqrt{2}}}{6}$ ⑤ $\dfrac{\sqrt{2+\sqrt{2}}}{8}$

17. [3 points]

Find the solution of

$\sqrt{3}\cos x-\sin x=\sqrt{2}$, $\left(0\le x\le\dfrac{\pi}{2}\right)$.

① $\dfrac{\pi}{12}$ ② $\dfrac{\pi}{9}$ ③ $\dfrac{5\pi}{12}$ ④ $\dfrac{4\pi}{9}$ ⑤ $\dfrac{7\pi}{12}$

18. [3 points]

When $y=ax+b$ is the tangent line to $f(x)=x^6+x^5+3x+6$ at $x=-1$, find $a+b$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

19. [3 points]

When the solutions of $3x^2-ax+1=0$ are $\sin\theta$ and $\cos\theta$ for $0\le\theta\le\dfrac{\pi}{2}$, find a.

① $\sqrt{2}$ ② $2\sqrt{2}$ ③ $2\sqrt{3}$ ④ $\sqrt{15}$ ⑤ $3\sqrt{2}$

20. [3 points]

When $4\sin^2\dfrac{x}{2}-1=\cos 2x$, find $\cos x$.

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

④ $\dfrac{\sqrt{5}-1}{3}$ ⑤ $\dfrac{\sqrt{5}-1}{\sqrt{6}}$

21. [4 points]

When M and m are the maximum and minimum values of $f(x)=\dfrac{1}{3}x^3-x^2+4$ for $0\le x\le 4$, find $M+m$.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

22. [4 points]
Find the minimum value of
$f(x) = \cos^3 x - \frac{1}{2}\cos 2x + \frac{3}{2}$, $0 \le x \le \frac{\pi}{2}$.
① $\frac{42}{27}$ ② $\frac{44}{27}$ ③ $\frac{46}{27}$ ④ $\frac{47}{27}$ ⑤ $\frac{50}{27}$

23. [4 points]
Find the shortest distance from $(0, 0)$ to the curve $3xy = 1$.
① $\frac{2}{3}$ ② $\frac{\sqrt{2}}{3}$ ③ $\frac{\sqrt{6}}{3}$ ④ $\frac{2\sqrt{2}}{3}$ ⑤ $\frac{4}{3}$

24. [4 points]
Find $\lim_{x\to\infty}\left(\sqrt{2x+3\sqrt{x}+1} - \sqrt{2x+5}\right)$.
① $3\sqrt{2}$ ② $\frac{3\sqrt{2}}{2}$ ③ $\frac{3\sqrt{2}}{4}$ ④ $\frac{\sqrt{2}}{2}$ ⑤ $\frac{3\sqrt{2}}{8}$

25. [4 points]
When $f(x) = (2x + \sqrt{x} - 4)^2$, find $f'(4)$.
① 21 ② 23 ③ 25 ④ 27 ⑤ 29

26. [4 points]
Find $\int_0^2 \frac{x}{(x+2)^3}\,dx$.
① $\frac{1}{2}$ ② $\frac{1}{4}$ ③ $\frac{1}{8}$ ④ $\frac{1}{12}$ ⑤ $\frac{1}{16}$

27. [4 points]
Find the area of the region enclosed by
$y = x^2 - 2$ and $y = 2x + 1$.
① $\frac{32}{3}$ ② $\frac{34}{3}$ ③ 12 ④ $\frac{38}{3}$ ⑤ $\frac{40}{3}$

28. [4 points]
When a function $f(x)$ satisfies
$f(x) = x^4 + \int_0^1 t f(t)\,dt$, find $\int_0^1 f(x)\,dx$.
① $\frac{2}{15}$ ② $\frac{4}{15}$ ③ $\frac{7}{15}$ ④ $\frac{8}{15}$ ⑤ $\frac{11}{15}$

29. [4 points]
Find $\lim_{x\to 0}\frac{\sin^2 3x}{1-\cos 2x}$.
① $\frac{1}{2}$ ② $\frac{3}{2}$ ③ $\frac{5}{2}$ ④ $\frac{7}{2}$ ⑤ $\frac{9}{2}$

30. [4 points]
Compute $\int_0^1 (2x^2 - 1)^2\,dx$.
① $\frac{4}{15}$ ② $\frac{7}{15}$ ③ $\frac{8}{15}$ ④ $\frac{11}{15}$ ⑤ $\frac{13}{15}$

2025 IUT SBL 1st Answer Sheets

Type A

No.	1	2	3	4	5	6	7	8	9	10
Ans.	②	③	⑤	①	⑤	②	④	③	②	⑤
No.	11	12	13	14	15	16	17	18	19	20
Ans.	⑤	③	④	①	③	④	②	①	①	④
No.	21	22	23	24	25	26	27	28	29	30
Ans.	③	④	②	⑤	③	⑤	②	⑤	①	④

Type B

No.	1	2	3	4	5	6	7	8	9	10
Ans.	⑤	②	③	⑤	①	⑤	②	④	③	②
No.	11	12	13	14	15	16	17	18	19	20
Ans.	③	⑤	③	④	①	④	④	②	①	①
No.	21	22	23	24	25	26	27	28	29	30
Ans.	③	③	④	②	⑤	④	⑤	②	⑤	①

Type C

No.	1	2	3	4	5	6	7	8	9	10
Ans.	①	⑤	②	③	⑤	②	⑤	②	④	③
No.	11	12	13	14	15	16	17	18	19	20
Ans.	①	③	⑤	③	④	①	④	④	②	①
No.	21	22	23	24	25	26	27	28	29	30
Ans.	⑤	③	③	④	②	①	④	⑤	②	⑤

Type D

No.	1	2	3	4	5	6	7	8	9	10
Ans.	⑤	①	⑤	②	③	③	②	⑤	②	④
No.	11	12	13	14	15	16	17	18	19	20
Ans.	④	①	③	⑤	③	①	①	④	④	②
No.	21	22	23	24	25	26	27	28	29	30
Ans.	②	⑤	③	③	④	⑤	①	④	⑤	②

2025 IUT 1st Admission Test(SOCIE)

Math & Physics Examination(TYPE A)

<Multiple choice Types> There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet.

○ For each correct answer, you will get the points indicated next to each question number.

○ No penalty point is applied to an incorrect answer.

1. [2 points]
Simplify $\log_2(3+\sqrt{5})(3-\sqrt{5})$.

① -2 ② -1 ③ 0 ④ 1 ⑤ 2

2. [2 points]
When $\sum_{k=1}^{n} a_k = 7$, $\sum_{k=1}^{n}(3a_k+2) = 45$, find n.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

3. [2 points]
When α, β, γ are the solutions of $x^3-4x^2-3x+1=0$, find $(\alpha-1)(\beta-1)(\gamma-1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

4. [2 points]
When $f(x)=(x+1)\sqrt{x^2+3}$, find $f'(1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

5. [2 points]
Find the coefficient of x^{10} in the expansion of $\left(x^2+\frac{2}{x}\right)^8$.

① 106 ② 108 ③ 110
④ 112 ⑤ 114

6. [2 points]
When $tg\theta = \frac{1}{7}$, find $\sin 2\theta$.

① $\frac{1}{25}$ ② $\frac{3}{25}$ ③ $\frac{1}{5}$
④ $\frac{7}{25}$ ⑤ $\frac{9}{25}$

7. [3 points]
Evaluate $\lim_{n\to\infty}(2^n+3^n)^{\frac{1}{n}}$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

8. [3 points]
Find the sum of all solutions of

$$\sin 2x - 2\sin^2 x = 2\cos x - 2,\ 0 \le x < 2\pi.$$

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

9. [3 points]
Evaluate $\int_e^{e^2} \frac{\ln x}{x}\,dx$.

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

10. [3 points]
When $A = \begin{pmatrix} 1 & 2 \\ -1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} -1 & a \\ 1 & a-1 \end{pmatrix}$ satisfy $BA = A^{-1}B^{-1}$, find a.

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

11. [3 points]
When $\sum_{n=1}^{\infty} \frac{a_n - 1}{a_n + 1}$ converges, find $\lim_{n\to\infty} \frac{2a_n + 1}{3a_n - 2}$.

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

12. [3 points]
When two vectors $\vec{a}$, $\vec{b}$ satisfy

$$|\vec{a}| = 3,\ |\vec{b}| = 2,\ |\vec{a} - \vec{b}| = 4,$$

find $|\vec{a} + \vec{b}|^2$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

13. [4 points]
When $\lim_{x\to 1} \frac{\sqrt{2x+7} - \sqrt{x+a}}{x^2 - 1} = b$ for some constants a and b, find ab.

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

14. [4 points]
Find the length of the curve

$$y = \frac{1}{6}(x^2 + 4)^{\frac{3}{2}},\ 1 \le x \le 2.$$

① $\frac{7}{6}$ ② $\frac{3}{2}$ ③ $\frac{11}{6}$ ④ $\frac{13}{6}$ ⑤ $\frac{5}{2}$

15. [4 points]
When a sequence $\{a_n\}_{n=1}^{\infty}$ satisfies

$$3n^2 - n < a_n < 3n^2 + 4n$$

for all positive integers n, find $\lim_{n\to\infty} \frac{2a_n}{5n^2 - 1}$.

① $\frac{6}{5}$ ② $\frac{8}{5}$ ③ 2 ④ $\frac{12}{5}$ ⑤ $\frac{14}{5}$

16. [4 points]

When the minimum value of $f(x)=\int_0^x (t+a)e^t dt$ is $-e^{-1}$ for some contant $a>0$, find a.

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

17. [4 points]

Evaluate $\lim_{n\to\infty} \frac{(1^2+2^2+3^2+\cdots+n^2)^2}{1^5+2^5+3^5+\cdots+n^5}$.

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

18. [5 points]

When two curves $y=x^2$ and $y=x^3-x+k$ meet only at two different points, find the positive constant k.

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

19. [5 points]

Find the distance between two circles

$x^2+y^2+2x+4y+4=0$, $x^2+y^2-4x-4y=1$.

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

20. [5 points]

When a polynomial $f(x)$ satisfy $\lim_{x\to 1}\frac{f(x)}{x-1}=2$ and $f(2x)=2xf'(x)+1$ for all real x, find $f(3)$.

① 4 ② 8 ③ 12 ④ 16 ⑤ 20

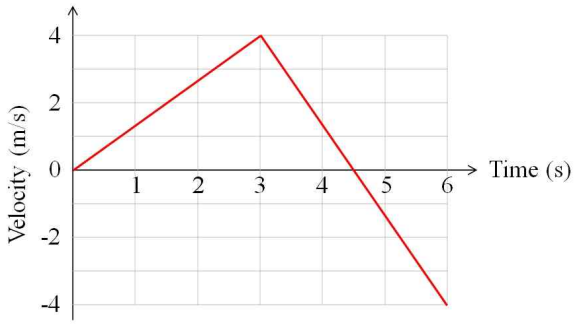
21. [5 points]

When $f(x)=e^x+2x$ and g is the inverse function of f, find $\int_1^{e+2} g(x)dx$.

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

22. [3 points]

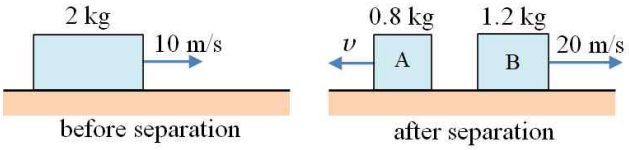
The relationship between the velocity and time of an object moving in a straight line is as shown in the graph. What is the average velocity over the first 6 seconds?



① 1 m/s ② 2 m/s ③ −1 m/s
④ −2 m/s ⑤ 1.5 m/s

23. [3 points]

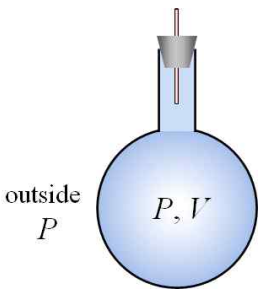
As shown in the figure, an object with a mass of 2 kg moves at a speed of 10 m/s on a frictionless horizontal surface. It is divided into A and B by an internal force and moves in opposite directions. The mass of object A is 0.8 kg, the mass of B is 1.2 kg, and the speed of B is 20 m/s. What is the speed of object A after separation?



① 2 m/s ② 4 m/s ③ 5 m/s
④ 8 m/s ⑤ 10 m/s

24. [4 points]

As shown in the figure, the flask is connected to the outside atmosphere at temperature $T_1(\mathrm{K})$ through a thin tube. Initially, the temperatures inside and outside the flask are the same. Now, when the temperature of the air inside the flask is increased to $T_2(\mathrm{K})$, how many times is the mass of the air that escapes from the flask compared to the mass of the air that was in the flask at the beginning?



① $\frac{T_2-T_1}{T_1+T_2}$ ② $\frac{T_2}{T_1+T_2}$ ③ $\frac{T_1}{T_2}$
④ $\frac{T_2-T_1}{T_1}$ ⑤ $\frac{T_2-T_1}{T_2}$

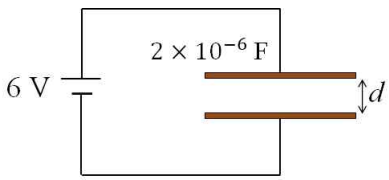
25. [3 points]

When a particle with a charge of $0.5\,\mathrm{C}$ is incident on an electric field and moves from a place where the electric potential is $4\,\mathrm{V}$ to a place where the electric potential is $2\,\mathrm{V}$, how will the kinetic energy of this particle change?

① decrease by 1 J ② increase by 1 J
③ decrease by 2 J ④ increase by 2 J
⑤ no change

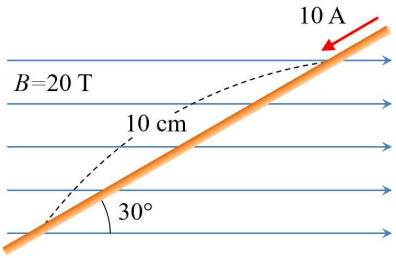
26. [3 points]

As shown in the figure, a parallel plate capacitor with a capacitance of $2\times10^{-6}\,\mathrm{F}$ is connected to a $6\,\mathrm{V}$ power supply. When the distance between the metal plates is $d=2\times10^{-3}\,\mathrm{m}$, what is the amount of charge stored in the capacitor and the electric field between the metal plates?



① $6\,\mu\mathrm{C}$, $1\times10^3\,\mathrm{V/m}$ ② $6\,\mu\mathrm{C}$, $2\times10^3\,\mathrm{V/m}$
③ $12\,\mu\mathrm{C}$, $2\times10^3\,\mathrm{V/m}$ ④ $12\,\mu\mathrm{C}$, $3\times10^3\,\mathrm{V/m}$
⑤ $15\,\mu\mathrm{C}$, $3\times10^3\,\mathrm{V/m}$

27. [3 points]
As shown in the figure, a current of $10\,\mathrm{A}$ is flowing through a wire placed at an angle of 30° to the magnetic field of $20\,\mathrm{T}$. What is the magnitude of the force acting on a $10\,\mathrm{cm}$ long section of the wire?

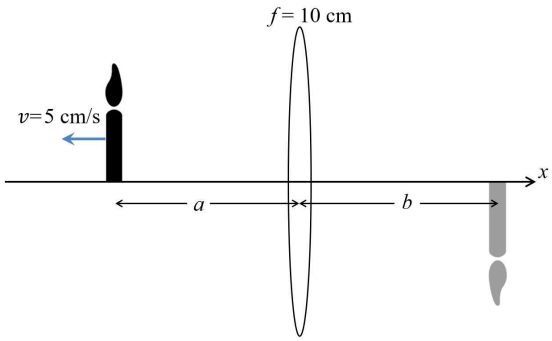


① $5\,\mathrm{N}$ ② $5\sqrt{3}\,\mathrm{N}$ ③ $10\,\mathrm{N}$
④ $10\sqrt{3}\,\mathrm{N}$ ⑤ $20\,\mathrm{N}$

28. [3 points]
Which of the following waves has properties different from the rest?

① sound wave ② x-ray
③ ultraviolet ray ④ visible light
⑤ microwave

29 [5 points]
As shown in the figure, there is an object moving away from a lens at a constant speed of $5\,\mathrm{cm/s}$ on the axis of the convex lens with a focal length of $10\,\mathrm{cm}$. When the distance from the lens to the object is $a = 15\,\mathrm{cm}$, what is the velocity of the image? (Here, the sign of the velocity is set to positive in the direction of the $x-$axis)



① $20\,\mathrm{cm/s}$ ② $10\,\mathrm{cm/s}$ ③ $5\,\mathrm{cm/s}$
④ $-10\,\mathrm{cm/s}$ ⑤ $-20\,\mathrm{cm/s}$

30 [3 points]
Particle A has a mass of $4m$ and a speed of v. And particle B has a mass of m and a speed of $3v$. Let the de Broglie wavelengths of particles A and B be λ_A and λ_B, respectively. What is $\lambda_A : \lambda_B$?

① 1 : 3 ② 3 : 4 ③ 4 : 3
④ 16 : 9 ⑤ 9 : 16

2025 IUT 1st Admission Test(SOCIE)

Math & Physics Examination(TYPE B)

<Multiple choice Types> There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet.

○ For each correct answer, you will get the points indicated next to each question number.

○ No penalty point is applied to an incorrect answer.

1. [2 points]

When $\sum_{k=1}^{n} a_k = 7$, $\sum_{k=1}^{n} (3a_k + 2) = 45$, find n.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

2. [2 points]

When α, β, γ are the solutions of $x^3 - 4x^2 - 3x + 1 = 0$, find $(\alpha - 1)(\beta - 1)(\gamma - 1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

3. [2 points]

Simplify $\log_2 (3 + \sqrt{5})(3 - \sqrt{5})$.

① -2 ② -1 ③ 0 ④ 1 ⑤ 2

4. [2 points]

When $tg\theta = \frac{1}{7}$, find $\sin 2\theta$.

① $\frac{1}{25}$ ② $\frac{3}{25}$ ③ $\frac{1}{5}$

④ $\frac{7}{25}$ ⑤ $\frac{9}{25}$

5. [2 points]

When $f(x) = (x+1)\sqrt{x^2+3}$, find $f'(1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

6. [2 points]

Find the coefficient of x^{10} in the expansion of $\left(x^2 + \frac{2}{x}\right)^8$.

① 106 ② 108 ③ 110

④ 112 ⑤ 114

7. [3 points]

Find the sum of all solutions of

$$\sin 2x - 2\sin^2 x = 2\cos x - 2, \ 0 \le x < 2\pi.$$

① π ② $\frac{3\pi}{2}$ ③ 2π

④ $\frac{5\pi}{2}$ ⑤ 3π

8. [3 points]

Evaluate $\lim_{n\to\infty}(2^n+3^n)^{\frac{1}{n}}$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

9. [3 points]

When two vectors $\vec{a}$, $\vec{b}$ satisfy

$$|\vec{a}|=3,\ |\vec{b}|=2,\ |\vec{a}-\vec{b}|=4,$$

find $|\vec{a}+\vec{b}|^2$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

10. [3 points]

Evaluate $\int_e^{e^2}\frac{\ln x}{x}dx$.

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

11. [3 points]

When $A=\begin{pmatrix}1 & 2\\ -1 & 1\end{pmatrix}$, $B=\begin{pmatrix}-1 & a\\ 1 & a-1\end{pmatrix}$ satisfy $BA=A^{-1}B^{-1}$, find a.

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

12. [3 points]

When $\sum_{n=1}^{\infty}\frac{a_n-1}{a_n+1}$ converges, find $\lim_{n\to\infty}\frac{2a_n+1}{3a_n-2}$.

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

13. [4 points]

When a sequence $\{a_n\}_{n=1}^{\infty}$ satisfies

$$3n^2-n<a_n<3n^2+4n$$

for all positive integers n, find $\lim_{n\to\infty}\frac{2a_n}{5n^2-1}$.

① $\frac{6}{5}$ ② $\frac{8}{5}$ ③ 2 ④ $\frac{12}{5}$ ⑤ $\frac{14}{5}$

14. [4 points]

When $\lim_{x\to1}\frac{\sqrt{2x+7}-\sqrt{x+a}}{x^2-1}=b$ for some constants a and b, find ab.

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

15. [4 points]

Find the length of the curve

$$y=\frac{1}{6}(x^2+4)^{\frac{3}{2}},\ 1\le x\le 2.$$

① $\frac{7}{6}$ ② $\frac{3}{2}$ ③ $\frac{11}{6}$ ④ $\frac{13}{6}$ ⑤ $\frac{5}{2}$

16. [4 points]

Evaluate $\lim_{n\to\infty}\frac{(1^2+2^2+3^2+\cdots+n^2)^2}{1^5+2^5+3^5+\cdots+n^5}$.

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

17. [4 points]

When the minimum value of $f(x)=\int_0^x (t+a)e^t dt$ is $-e^{-1}$ for some contant $a>0$, find a.

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

18. [5 points]

When $f(x)=e^x+2x$ and g is the inverse function of f, find $\int_1^{e+2} g(x)dx$.

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19. [5 points]

When two curves $y=x^2$ and $y=x^3-x+k$ meet only at two different points, find the positive constant k.

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

20. [5 points]

Find the distance between two circles

$x^2+y^2+2x+4y+4=0,\ x^2+y^2-4x-4y=1$.

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

21. [5 points]

When a polynomial $f(x)$ satisfy $\lim_{x\to 1}\frac{f(x)}{x-1}=2$ and $f(2x)=2xf'(x)+1$ for all real x, find $f(3)$.

① 4 ② 8 ③ 12 ④ 16 ⑤ 20

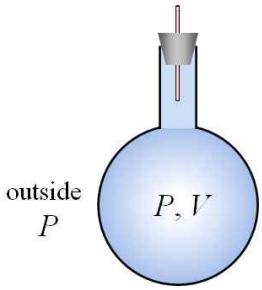
22. [3 points]

When a particle with a charge of 0.5C is incident on an electric field and moves from a place where the electric potential is 4V to a place where the electric potential is 2V, how will the kinetic energy of this particle change?

① decrease by 1J ② increase by 1J
③ decrease by 2J ④ increase by 2J
⑤ no change

23. [4 points]

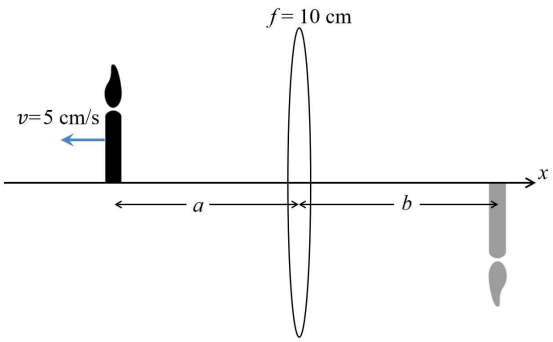
As shown in the figure, the flask is connected to the outside atmosphere at temperature $T_1(\mathrm{K})$ through a thin tube. Initially, the temperatures inside and outside the flask are the same. Now, when the temperature of the air inside the flask is increased to $T_2(\mathrm{K})$, how many times is the mass of the air that escapes from the flask compared to the mass of the air that was in the flask at the beginning?



① $\frac{T_2-T_1}{T_1+T_2}$ ② $\frac{T_2}{T_1+T_2}$ ③ $\frac{T_1}{T_2}$
④ $\frac{T_2-T_1}{T_1}$ ⑤ $\frac{T_2-T_1}{T_2}$

24. [5 points]

As shown in the figure, there is an object moving away from a lens at a constant speed of $5\,\mathrm{cm/s}$ on the axis of the convex lens with a focal length of $10\,\mathrm{cm}$. When the distance from the lens to the object is $a=15\,\mathrm{cm}$, what is the velocity of the image? (Here, the sign of the velocity is set to positive in the direction of the $x-$axis)



① $20\,\mathrm{cm/s}$ ② $10\,\mathrm{cm/s}$ ③ $5\,\mathrm{cm/s}$
④ $-10\,\mathrm{cm/s}$ ⑤ $-20\,\mathrm{cm/s}$

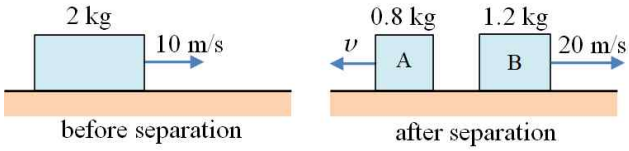
25. [3 points]

Which of the following waves has properties different from the rest?

① sound wave ② x-ray
③ ultraviolet ray ④ visible light
⑤ microwave

26. [3 points]

As shown in the figure, an object with a mass of 2 kg moves at a speed of 10 m/s on a frictionless horizontal surface. It is divided into A and B by an internal force and moves in opposite directions. The mass of object A is 0.8 kg, the mass of B is 1.2 kg, and the speed of B is 20 m/s. What is the speed of object A after separation?



① 2 m/s ② 4 m/s ③ 5 m/s
④ 8 m/s ⑤ 10 m/s

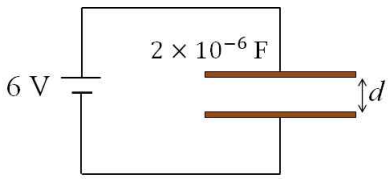
27. [3 points]

Particle A has a mass of $4m$ and a speed of v. And particle B has a mass of m and a speed of $3v$. Let the de Broglie wavelengths of particles A and B be λ_A and λ_B, respectively. What is $\lambda_A : \lambda_B$?

① 1 : 3 ② 3 : 4 ③ 4 : 3
④ 16 : 9 ⑤ 9 : 16

28. [3 points]

As shown in the figure, a parallel plate capacitor with a capacitance of $2\times10^{-6}\,\mathrm{F}$ is connected to a $6\,\mathrm{V}$ power supply. When the distance between the metal plates is $d=2\times10^{-3}\,\mathrm{m}$, what is the amount of charge stored in the capacitor and the electric field between the metal plates?



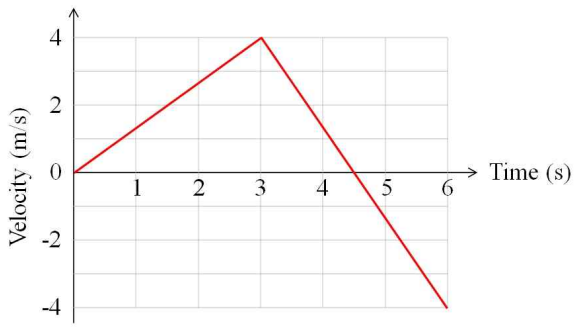
① $6\,\mu\mathrm{C}$, $1\times10^{3}\,\mathrm{V/m}$ ② $6\,\mu\mathrm{C}$, $2\times10^{3}\,\mathrm{V/m}$

③ $12\,\mu\mathrm{C}$, $2\times10^{3}\,\mathrm{V/m}$ ④ $12\,\mu\mathrm{C}$, $3\times10^{3}\,\mathrm{V/m}$

⑤ $15\,\mu\mathrm{C}$, $3\times10^{3}\,\mathrm{V/m}$

29. [3 points]

The relationship between the velocity and time of an object moving in a straight line is as shown in the graph. What is the average velocity over the first 6 seconds?

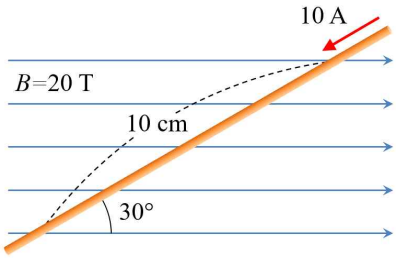


① 1 m/s ② 2 m/s ③ −1 m/s

④ −2 m/s ⑤ 1.5 m/s

30. [3 points]

As shown in the figure, a current of $10\,\mathrm{A}$ is flowing through a wire placed at an angle of 30° to the magnetic field of $20\,\mathrm{T}$. What is the magnitude of the force acting on a $10\,\mathrm{cm}$ long section of the wire?



① 5 N ② $5\sqrt{3}$ N ③ 10 N

④ $10\sqrt{3}$ N ⑤ 20 N

2025 IUT 1st Admission Test(SOCIE)

Math & Physics Examination(TYPE C)

<Multiple choice Types> There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet.

○ For each correct answer, you will get the points indicated next to each question number.

○ No penalty point is applied to an incorrect answer.

1. [2 points]
When α, β, γ are the solutions of $x^3-4x^2-3x+1=0$, find $(\alpha-1)(\beta-1)(\gamma-1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

2. [2 points]
When $\sum_{k=1}^{n} a_k = 7$, $\sum_{k=1}^{n}(3a_k+2) = 45$, find n.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

3. [2 points]
Find the coefficient of x^{10} in the expansion of $\left(x^2+\frac{2}{x}\right)^8$.

① 106 ② 108 ③ 110
④ 112 ⑤ 114

4. [2 points]
Simplify $\log_2(3+\sqrt{5})(3-\sqrt{5})$.

① -2 ② -1 ③ 0 ④ 1 ⑤ 2

5. [2 points]
When $tg\theta = \frac{1}{7}$, find $\sin 2\theta$.

① $\frac{1}{25}$ ② $\frac{3}{25}$ ③ $\frac{1}{5}$
④ $\frac{7}{25}$ ⑤ $\frac{9}{25}$

6. [2 points]
When $f(x)=(x+1)\sqrt{x^2+3}$, find $f'(1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

7. [3 points]
When two vectors $\vec{a}$, $\vec{b}$ satisfy
$|\vec{a}|=3$, $|\vec{b}|=2$, $|\vec{a}-\vec{b}|=4$,
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① 2 ② 4 ③ 6 ④ 8 ⑤ 10

8. [3 points]
Find the sum of all solutions of
$$\sin 2x - 2\sin^2 x = 2\cos x - 2,\ 0 \le x < 2\pi.$$

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

9. [3 points]
Evaluate $\lim_{n\to\infty}(2^n+3^n)^{\frac{1}{n}}$.

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

11. [3 points]
When $\sum_{n=1}^{\infty}\frac{a_n-1}{a_n+1}$ converges, find $\lim_{n\to\infty}\frac{2a_n+1}{3a_n-2}$.

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12. [3 points]
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13. [4 points]
Find the length of the curve
$$y=\frac{1}{6}(x^2+4)^{\frac{3}{2}},\ 1\le x\le 2.$$

① $\frac{7}{6}$ ② $\frac{3}{2}$ ③ $\frac{11}{6}$ ④ $\frac{13}{6}$ ⑤ $\frac{5}{2}$

14. [4 points]
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16. [4 points]

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17. [4 points]

Evaluate $\lim_{n\to\infty} \frac{(1^2+2^2+3^2+\cdots+n^2)^2}{1^5+2^5+3^5+\cdots+n^5}$.

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

18. [5 points]

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19. [5 points]

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20. [5 points]

When two curves $y=x^2$ and $y=x^3-x+k$ meet only at two different points, find the positive constant k.

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

21. [5 points]

Find the distance between two circles $x^2+y^2+2x+4y+4=0$, $x^2+y^2-4x-4y=1$.

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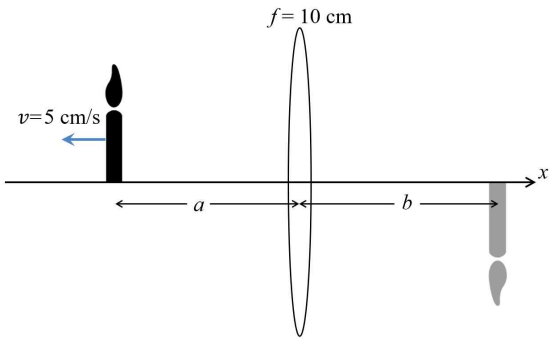
22. [5 points]

As shown in the figure, there is an object moving away from a lens at a constant speed of $5\,\mathrm{cm/s}$ on the axis of the convex lens with a focal length of $10\,\mathrm{cm}$. When the distance from the lens to the object is $a=15\,\mathrm{cm}$, what is the velocity of the image? (Here, the sign of the velocity is set to positive in the direction of the $x-$axis)



① $20\,\mathrm{cm/s}$ ② $10\,\mathrm{cm/s}$ ③ $5\,\mathrm{cm/s}$
④ $-10\,\mathrm{cm/s}$ ⑤ $-20\,\mathrm{cm/s}$

23. [3 points]

When a particle with a charge of $0.5\,\mathrm{C}$ is incident on an electric field and moves from a place where the electric potential is $4\,\mathrm{V}$ to a place where the electric potential is $2\,\mathrm{V}$, how will the kinetic energy of this particle change?

① decrease by $1\,\mathrm{J}$ ② increase by $1\,\mathrm{J}$
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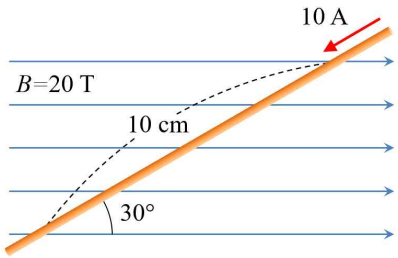
24. [3 points]

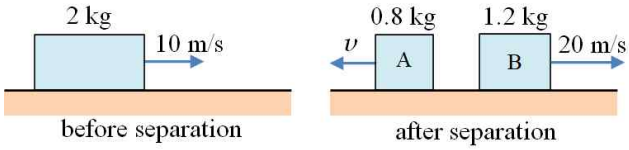
As shown in the figure, a current of $10\,\mathrm{A}$ is flowing through a wire placed at an angle of 30° to the magnetic field of $20\,\mathrm{T}$. What is the magnitude of the force acting on a $10\,\mathrm{cm}$ long section of the wire?



① $5\,\mathrm{N}$ ② $5\sqrt{3}\,\mathrm{N}$ ③ $10\,\mathrm{N}$
④ $10\sqrt{3}\,\mathrm{N}$ ⑤ $20\,\mathrm{N}$

25. [3 points]

As shown in the figure, an object with a mass of 2 kg moves at a speed of 10 m/s on a frictionless horizontal surface. It is divided into A and B by an internal force and moves in opposite directions. The mass of object A is 0.8 kg, the mass of B is 1.2 kg, and the speed of B is 20 m/s. What is the speed of object A after separation?



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④ 16 : 9 ⑤ 9 : 16

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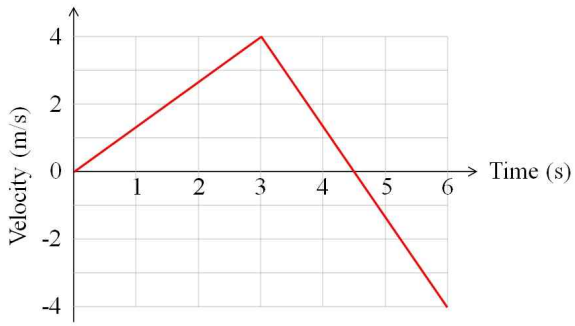

① 1 m/s ② 2 m/s ③ −1 m/s
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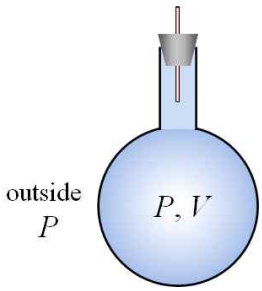
As shown in the figure, the flask is connected to the outside atmosphere at temperature $T_1(\mathrm{K})$ through a thin tube. Initially, the temperatures inside and outside the flask are the same. Now, when the temperature of the air inside the flask is increased to $T_2(\mathrm{K})$, how many times is the mass of the air that escapes from the flask compared to the mass of the air that was in the flask at the beginning?



① $\frac{T_2-T_1}{T_1+T_2}$ ② $\frac{T_2}{T_1+T_2}$ ③ $\frac{T_1}{T_2}$
④ $\frac{T_2-T_1}{T_1}$ ⑤ $\frac{T_2-T_1}{T_2}$

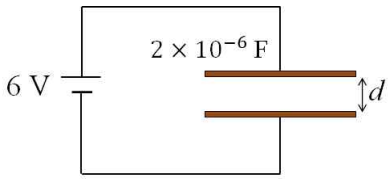
29. [3 points]

Which of the following waves has properties different from the rest?

① sound wave ② x-ray
③ ultraviolet ray ④ visible light
⑤ microwave

30. [3 points]

As shown in the figure, a parallel plate capacitor with a capacitance of $2\times10^{-6}\,\mathrm{F}$ is connected to a $6\,\mathrm{V}$ power supply. When the distance between the metal plates is $d=2\times10^{-3}\,\mathrm{m}$, what is the amount of charge stored in the capacitor and the electric field between the metal plates?



① $6\,\mu\mathrm{C}$, $1\times10^3\,\mathrm{V/m}$ ② $6\,\mu\mathrm{C}$, $2\times10^3\,\mathrm{V/m}$
③ $12\,\mu\mathrm{C}$, $2\times10^3\,\mathrm{V/m}$ ④ $12\,\mu\mathrm{C}$, $3\times10^3\,\mathrm{V/m}$
⑤ $15\,\mu\mathrm{C}$, $3\times10^3\,\mathrm{V/m}$

2025 IUT 1st Admission Test(SOCIE)

Math & Physics Examination(TYPE D)

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1. [2 points]
When $f(x)=(x+1)\sqrt{x^2+3}$, find $f'(1)$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

2. [2 points]
When α, β, γ are the solutions of $x^3-4x^2-3x+1=0$, find $(\alpha-1)(\beta-1)(\gamma-1)$.

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3. [2 points]
When $\sum_{k=1}^{n} a_k = 7$, $\sum_{k=1}^{n}(3a_k+2)=45$, find n.

① 10 ② 12 ③ 14 ④ 16 ⑤ 18

4. [2 points]
Find the coefficient of x^{10} in the expansion of $\left(x^2+\frac{2}{x}\right)^8$.

① 106 ② 108 ③ 110
④ 112 ⑤ 114

5. [2 points]
Simplify $\log_2(3+\sqrt{5})(3-\sqrt{5})$.

① -2 ② -1 ③ 0 ④ 1 ⑤ 2

6. [2 points]
When $tg\theta=\frac{1}{7}$, find $\sin 2\theta$.

① $\frac{1}{25}$ ② $\frac{3}{25}$ ③ $\frac{1}{5}$
④ $\frac{7}{25}$ ⑤ $\frac{9}{25}$

7. [3 points]
When $\sum_{n=1}^{\infty}\frac{a_n-1}{a_n+1}$ converges, find $\lim_{n\to\infty}\frac{2a_n+1}{3a_n-2}$.

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

8. [3 points]

When two vectors $\vec{a}$, $\vec{b}$ satisfy

$$|\vec{a}|=3,\ |\vec{b}|=2,\ |\vec{a}-\vec{b}|=4,$$

find $|\vec{a}+\vec{b}|^2$.

① 2 ② 4 ③ 6 ④ 8 ⑤ 10

9. [3 points]

Find the sum of all solutions of

$$\sin 2x-2\sin^2 x=2\cos x-2,\ 0\le x<2\pi.$$

① π ② $\frac{3\pi}{2}$ ③ 2π

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10. [3 points]

Evaluate $\lim_{n\to\infty}(2^n+3^n)^{\frac{1}{n}}$.

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11. [3 points]

When $A=\begin{pmatrix}1 & 2\\ -1 & 1\end{pmatrix}$, $B=\begin{pmatrix}-1 & a\\ 1 & a-1\end{pmatrix}$ satisfy $BA=A^{-1}B^{-1}$, find a.

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

12. [3 points]

Evaluate $\int_e^{e^2}\frac{\ln x}{x}dx$.

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

13. [4 points]

Find the length of the curve

$$y=\frac{1}{6}(x^2+4)^{\frac{3}{2}},\ 1\le x\le 2.$$

① $\frac{7}{6}$ ② $\frac{3}{2}$ ③ $\frac{11}{6}$ ④ $\frac{13}{6}$ ⑤ $\frac{5}{2}$

14. [4 points]

When $\lim_{x\to 1}\frac{\sqrt{2x+7}-\sqrt{x+a}}{x^2-1}=b$ for some constants a and b, find ab.

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

15. [4 points]

When the minimum value of $f(x)=\int_0^x(t+a)e^t dt$ is $-e^{-1}$ for some contant $a>0$, find a.

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

16. [4 points]

When a sequence $\{a_n\}_{n=1}^{\infty}$ satisfies

$$3n^2 - n < a_n < 3n^2 + 4n$$

for all positive integers n, find $\lim_{n\to\infty} \frac{2a_n}{5n^2-1}$.

① $\frac{6}{5}$ ② $\frac{8}{5}$ ③ 2 ④ $\frac{12}{5}$ ⑤ $\frac{14}{5}$

17. [4 points]

Evaluate $\lim_{n\to\infty} \frac{(1^2+2^2+3^2+\cdots+n^2)^2}{1^5+2^5+3^5+\cdots+n^5}$.

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

18. [5 points]

When a polynomial $f(x)$ satisfy $\lim_{x\to 1} \frac{f(x)}{x-1} = 2$ and $f(2x) = 2xf'(x) + 1$ for all real x, find $f(3)$.

① 4 ② 8 ③ 12 ④ 16 ⑤ 20

19. [5 points]

When two curves $y = x^2$ and $y = x^3 - x + k$ meet only at two different points, find the positive constant k.

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

20. [5 points]

When $f(x) = e^x + 2x$ and g is the inverse function of f, find $\int_1^{e+2} g(x)dx$.

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

21. [5 points]

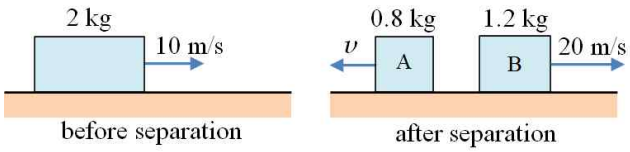
Find the distance between two circles

$$x^2 + y^2 + 2x + 4y + 4 = 0,\ x^2 + y^2 - 4x - 4y = 1.$$

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

22. [3 points]

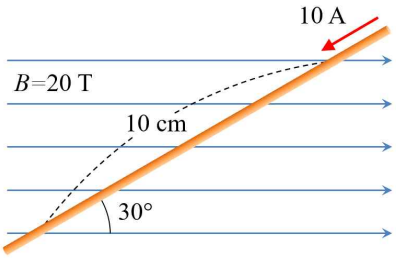
As shown in the figure, an object with a mass of 2 kg moves at a speed of 10 m/s on a frictionless horizontal surface. It is divided into A and B by an internal force and moves in opposite directions. The mass of object A is 0.8 kg, the mass of B is 1.2 kg, and the speed of B is 20 m/s. What is the speed of object A after separation?



① 2 m/s ② 4 m/s ③ 5 m/s
④ 8 m/s ⑤ 10 m/s

23. [3 points]

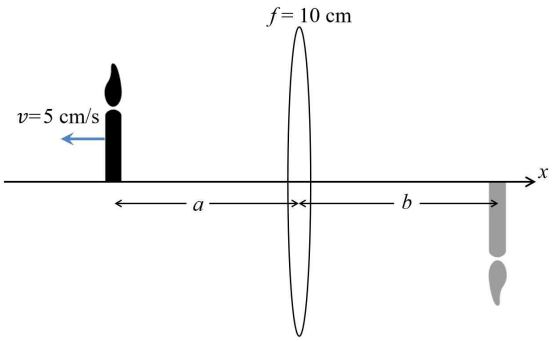
As shown in the figure, a current of $10\,\mathrm{A}$ is flowing through a wire placed at an angle of 30° to the magnetic field of $20\,\mathrm{T}$. What is the magnitude of the force acting on a $10\,\mathrm{cm}$ long section of the wire?



① $5\,\mathrm{N}$ ② $5\sqrt{3}\,\mathrm{N}$ ③ $10\,\mathrm{N}$
④ $10\sqrt{3}\,\mathrm{N}$ ⑤ $20\,\mathrm{N}$

24. [5 points]

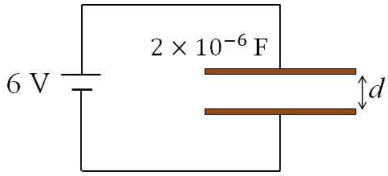
As shown in the figure, there is an object moving away from a lens at a constant speed of $5\,\mathrm{cm/s}$ on the axis of the convex lens with a focal length of $10\,\mathrm{cm}$. When the distance from the lens to the object is $a = 15\,\mathrm{cm}$, what is the velocity of the image? (Here, the sign of the velocity is set to positive in the direction of the $x-$axis)



① $20\,\mathrm{cm/s}$ ② $10\,\mathrm{cm/s}$ ③ $5\,\mathrm{cm/s}$
④ $-10\,\mathrm{cm/s}$ ⑤ $-20\,\mathrm{cm/s}$

25. [3 points]

As shown in the figure, a parallel plate capacitor with a capacitance of $2\times10^{-6}\,\mathrm{F}$ is connected to a $6\,\mathrm{V}$ power supply. When the distance between the metal plates is $d = 2\times10^{-3}\,\mathrm{m}$, what is the amount of charge stored in the capacitor and the electric field between the metal plates?



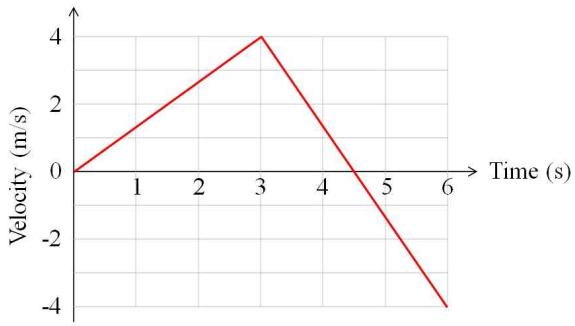
① $6\,\mu\mathrm{C}$, $1\times10^3\,\mathrm{V/m}$ ② $6\,\mu\mathrm{C}$, $2\times10^3\,\mathrm{V/m}$
③ $12\,\mu\mathrm{C}$, $2\times10^3\,\mathrm{V/m}$ ④ $12\,\mu\mathrm{C}$, $3\times10^3\,\mathrm{V/m}$
⑤ $15\,\mu\mathrm{C}$, $3\times10^3\,\mathrm{V/m}$

26. [3 points]

When a particle with a charge of $0.5\,\mathrm{C}$ is incident on an electric field and moves from a place where the electric potential is $4\,\mathrm{V}$ to a place where the electric potential is $2\,\mathrm{V}$, how will the kinetic energy of this particle change?

① decrease by $1\,\mathrm{J}$ ② increase by $1\,\mathrm{J}$
③ decrease by $2\,\mathrm{J}$ ④ increase by $2\,\mathrm{J}$
⑤ no change

27. [3 points]
The relationship between the velocity and time of an object moving in a straight line is as shown in the graph. What is the average velocity over the first 6 seconds?

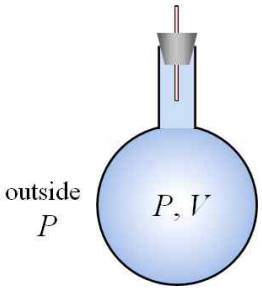


① 1 m/s ② 2 m/s ③ −1 m/s
④ −2 m/s ⑤ 1.5 m/s

28. [3 points]
Particle A has a mass of $4m$ and a speed of v. And particle B has a mass of m and a speed of $3v$. Let the de Broglie wavelengths of particles A and B be λ_A and λ_B, respectively. What is $\lambda_A : \lambda_B$?

① 1 : 3 ② 3 : 4 ③ 4 : 3
④ 16 : 9 ⑤ 9 : 16

29. [4 points]
As shown in the figure, the flask is connected to the outside atmosphere at temperature $T_1(\mathrm{K})$ through a thin tube. Initially, the temperatures inside and outside the flask are the same. Now, when the temperature of the air inside the flask is increased to $T_2(\mathrm{K})$, how many times is the mass of the air that escapes from the flask compared to the mass of the air that was in the flask at the beginning?



① $\frac{T_2 - T_1}{T_1 + T_2}$ ② $\frac{T_2}{T_1 + T_2}$ ③ $\frac{T_1}{T_2}$
④ $\frac{T_2 - T_1}{T_1}$ ⑤ $\frac{T_2 - T_1}{T_2}$

30. [3 points]
Which of the following waves has properties different from the rest?

① sound wave ② x-ray
③ ultraviolet ray ④ visible light
⑤ microwave

2025 IUT SOCIE 1st Answer Sheets

Type A

No.	1	2	3	4	5	6	7	8	9	10
Ans.	⑤	②	⑤	③	④	④	③	③	③	⑤
No.	11	12	13	14	15	16	17	18	19	20
Ans.	③	⑤	②	④	①	②	②	①	①	④
No.	21	22	23	24	25	26	27	28	29	30
Ans.	④	①	③	⑤	②	④	③	①	⑤	②

Type B

No.	1	2	3	4	5	6	7	8	9	10
Ans.	②	⑤	⑤	④	③	④	③	③	⑤	③
No.	11	12	13	14	15	16	17	18	19	20
Ans.	⑤	③	①	②	④	②	②	④	①	①
No.	21	22	23	24	25	26	27	28	29	30
Ans.	④	②	⑤	⑤	①	③	②	④	①	③

Type C

No.	1	2	3	4	5	6	7	8	9	10
Ans.	⑤	②	④	⑤	④	③	⑤	③	③	⑤
No.	11	12	13	14	15	16	17	18	19	20
Ans.	③	③	④	①	②	②	②	④	④	①
No.	21	22	23	24	25	26	27	28	29	30
Ans.	①	⑤	②	③	③	②	①	⑤	①	④

Type D

No.	1	2	3	4	5	6	7	8	9	10
Ans.	③	⑤	②	④	⑤	④	③	⑤	③	③
No.	11	12	13	14	15	16	17	18	19	20
Ans.	⑤	③	④	②	②	①	②	④	①	④
No.	21	22	23	24	25	26	27	28	29	30
Ans.	①	③	③	⑤	④	②	①	②	⑤	①