

2021 IUT Admission Test(SBL)
Math Examination

<Essay Types> Applicants should write detailed solving process. If there is no solution, you will receive 0 points regardless of the correct answer.

○ The point for each question is indicated next to each question number.

1. [5 points]

When $\alpha^2 = \sqrt{3+2\sqrt{2}}$, find $\frac{\alpha^3 - \alpha^{-3}}{\alpha - \alpha^{-1}}$.



2. [5 points]

Evaluate $\log_3 \frac{243}{2} - \log_9 \frac{81}{4}$.



3. [5 points]

When $a = \frac{\sqrt{3}+i}{2}$, find a^{100} .

4. [5 points]

Find $\cos \frac{\pi}{8}$.

5. [10 points]

When $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}^{100} = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, find $a+b+c+d$.

6. [10 points]

When an arithmetic sequence $\{a_n\}_{n=1}^{\infty}$ satisfies $a_1 + a_3 = 12$, $a_7 + a_9 = 34$, find a_{13} .

Here an arithmetic sequence means a sequence $\{a_n\}_{n=1}^{\infty}$ such that $a_n - a_{n-1}$ is constant for all n .

7. [10 points]

Find $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\sin \theta \operatorname{tg} \theta}$.

8. [10 points]

When $f(x) = \frac{(2x^2 - 3x + 2)^{50}}{x^2 + 1}$, find $f'(1)$.

9. [20 points]

Find $\lim_{n \rightarrow \infty} \frac{1^4 + 2^4 + 3^4 + \dots + n^4}{n^5}$.

10. [20 points]

Find the area of the region enclosed by $y = x^2 - 3x + 1$ and $y = -x^2 - x + 5$.