Math Examination (Sample)

< 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. Find $\displaystyle\lim_{x\to 0}\frac{\log_6(x^2+x+1)}{2^x+3^x-2}$.

① 0 　② 1 　③ $\dfrac{1}{(\ln 2)^2}$ 　④ $\dfrac{1}{(\ln 3)^2}$ 　⑤ $\dfrac{1}{(\ln 6)^2}$

2. When t is a solution of $x^6+x^5+\cdots+x+1=0$, and $\displaystyle\sum_{n=0}^{50}t^n=at^2+bt+c$ for some integers $a,\,b,\,c$, find $a+b+c$.

① 0 　　② 2 　　③ 4 　　④ 6 　　⑤ 8

3. When $A=\begin{pmatrix}0 & 1\\ -1 & 1\end{pmatrix}$, $B=\begin{pmatrix}5 & 3\\ -2 & 7\end{pmatrix}$ and $B^{-1}A^{27}B=\begin{pmatrix}a & b\\ c & d\end{pmatrix}$, find $a+b+c+d$.

① -2 　　② -1 　　③ 0 　④ 1 　　⑤ 2

4. Find the sum of all solutions of
$$\sin x-\sqrt{3}\cos x=1\,,\ (\,0\le x\le 2\pi\,).$$

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

5. Find the maximum value of $f(x)=\dfrac{\sqrt{x}}{3x^2+1}$ for $x>0$.

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

6. Find the volume of the solid obtained by rotating the region enclosed by $y=-x^2+4$ and $y=x+2$ about the x-axis.

① $\dfrac{93}{5}\pi$ 　　　② $\dfrac{98}{5}\pi$ 　　　③ $\dfrac{103}{5}\pi$

④ $\dfrac{108}{5}\pi$ 　　　⑤ $\dfrac{113}{5}\pi$