2007年度日本政府（文部科学省）奨学金留学生選考試験

QUALIFYING EXAMINATION FOR APPLICANTS FOR JAPANESE GOVERNMENT (MONBUKAGAKUSHO) SCHOLARSHIPS 2007

学科試験　　問題

EXAMINATION QUESTIONS

（専修留学生）

SPECIAL TRAINING COLLEGE STUDENTS

数　　学

MATHEMATICS

注意　☆試験時間は60分。

PLEASE NOTE : THE TEST PERIOD IS 60 MINUTES.

(2007)

MATHEMATICS

Nationality		No.	
Name	(Please print full name, underlining family name)		

Marks	

1 Fill in the following blanks with the correct answers.

(1) When $\dfrac{a+b}{4}=\dfrac{b+c}{5}=\dfrac{c+a}{6}$, then ratio $a:b:c=1:$ ① ____ : ② ____ .

(2) When $a=3+2\sqrt{2}$ and $b=3-2\sqrt{2}$, then $a^2+b^2=$ ① ____ ,

$\dfrac{a^2}{b}+\dfrac{b^2}{a}=$ ② ____ .

(3) $\cos 30^\circ \sin 45^\circ \tan 60^\circ + \cos 135^\circ \sin 120^\circ \tan 150^\circ =$ ____ .

(4) The solutions of an equation $(x+1)^2+9(x+1)+20=0$ are

① ____ and ② ____ .

(5) When the range of x determined by $-ax^2+bx+4 \geqq 0$ is $-\dfrac{1}{3} \leqq x \leqq 4$,

then $a=$ ① ____ and $b=$ ② ____ .

(6) When $a=3$ and $b=2$, then $\log_a b^a \times \log_b a^b =$ ____ .

(7) Let $f(x)=-x^2-2ax+b \quad (a \neq 0)$.

When $f(1)=3$ and the maximum value of $f(x)$ is 4,

then $a=$ ① ____ , $b=$ ② ____ .

(8) Let a sequence $\{a_n\}$: 2, 5, 8, 11, ……, a_n. If $a_n > 100$, the minimum value of n is [ ].

(9) Let $f(x) = x^3 - 2x + 4$.

(i) $f(2) =$ [ ].

(ii) Differential coefficient $f'(2) =$ [ ].

(iii) If $f(x) = 0$, the real value of $x =$ [ ].

(iv) The definite integral $\int_0^2 f(x)\,dx =$ [ ].

2 On the plane xy, there are four points: A(a, b), B$(-1, 0)$, C$(2, 1)$ and D$(0, 2)$.

(1) If point D is the center of △ABC, then

$a =$ [ ], $b =$ [ ].

(2) If quadrilateral ABCD is a parallelogram, then

$a =$ [ ], $b =$ [ ].

(3) If ∠ABC = 90° and point D is on the side AC, then

$a =$ [ ], $b =$ [ ].

(4) If vector $\overrightarrow{CA} = 2\overrightarrow{CB} - 3\overrightarrow{CD}$, then

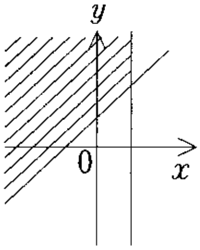
$a =$ [ ], $b =$ [ ].

(5) If scalar product $\overrightarrow{BA} \cdot \overrightarrow{BC} = -2$ and scalar product $\overrightarrow{BA} \cdot \overrightarrow{BD} = 1$, then

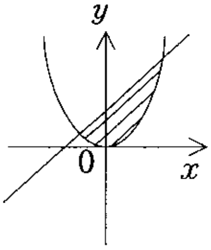
$a =$ [ ], $b =$ [ ].

3 Choose two inequalities which represent the hatched area not containing the border, from ①~⑩.

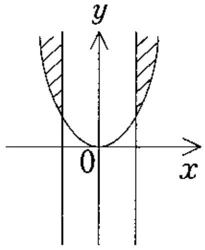
(1)



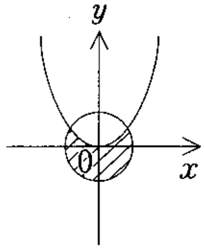
(2)



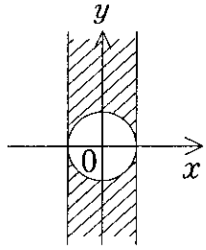
(3)



(4)



(5)



① $x > 1$　② $x < 1$　③ $|x| > 1$　④ $|x| < 1$　⑤ $y > x+1$

⑥ $y < x+1$　⑦ $y > x^2$　⑧ $y < x^2$　⑨ $x^2+y^2 > 1$　⑩ $x^2+y^2 < 1$