

2006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 2006

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.

MATHEMATICS

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

1 Fill in the following blanks with the correct answers.

(1) $\sqrt{5-2\sqrt{6}} - \frac{1}{\sqrt{2}+\sqrt{3}} = \boxed{}$.

(2) $(-2x^2y^3)^2 \div (-xy^2)^3 = \boxed{}$.

(3) The solution of an exponential equation, $4^x - 2^{x+1} - 15 = 0$, is $\boxed{}$.

(4) The largest solution of a triangle equation,

$2 \cos^2 x + 3 \sin x - 3 = 0, (0^\circ \leq x \leq 180^\circ)$, is $\boxed{}$.

(5) If a sequence, $a_1 = 1, a_2 = 2, a_3 = 5, a_4 = 10, a_5 = 17, \dots$, then

$a_8 = \boxed{}$.

(6) Let $f(x) = x^2 - 2x - 3$ and $g(x) = x^2 + ax + b$.

(i) The graph of $y = f(x)$ shows a parabola whose vertex is

($\textcircled{1}$ $\boxed{}$, $\textcircled{2}$ $\boxed{}$).

(ii) When $f(x) = 0$, $x = \textcircled{1}$ $\boxed{}$ or $\textcircled{2}$ $\boxed{}$.

(iii) When $a = \textcircled{1}$ $\boxed{}$ and $b = \textcircled{2}$ $\boxed{}$, then the graph

shown by shifting the graph of $y = f(x)$ by +1 on the X axis and by +2

on the Y axis, agrees with the graph of $y = g(x)$.

(iv) When $a = \text{①}$ and $b = \text{②}$, the ranges of x , which satisfy the two inequalities, $f(x) < 0$ and $g(x) > 0$, at the same time, are $-1 < x < 1$ and $2 < x < 3$.

(v) Differential coefficient $f'(3) = \text{①}$, and definite integral $\int_0^3 f(x) dx = \text{②}$.

2 On the plane xy , as shown in the Figure, the equation of line AB is $y = 3x + 4$, line AC is perpendicular to line AB and $\angle ABC = \alpha$.

Fill in the following blanks with correct answers.

(1) $\tan \alpha = \text{[]}$.

(2) $\sin \alpha = \text{[]}$.

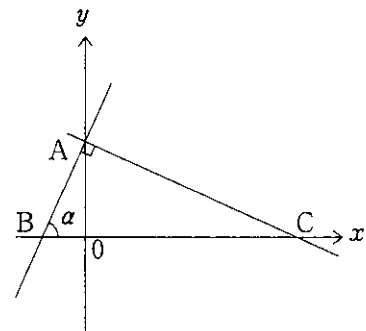
(3) The x-coordinate of point C is [] .

(4) The equation of line AC is $y = \text{[]}$.

(5) If point M is the middle point of segment BC, then

vector $\overrightarrow{AM} = \text{①} \overrightarrow{AB} + \text{②} \overrightarrow{AC}$,

and the scalar product of two vectors $\overrightarrow{MA} \cdot \overrightarrow{AC} = \text{③}$.



3 Twelve graphs of $y = ax^2 + bx + c$, ①~⑫ are shown below.

Six conditions for a, b, c and $b^2 - 4ac$ are listed in the table.

Choose the correct graph from ①~⑫ to satisfy each condition and fill in the each blank with the number.

	a	b	c	$b^2 - 4ac$	Graph
(1)	0	—	+	+	
(2)	—	0	—	—	
(3)	+	+	0	+	
(4)	—	+	—	0	
(5)	—	+	—	+	
(6)	+	—	+	—	

