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

(学部留学生)

UNDERGRADUATE STUDENTS

数 学(A)

MATHEMATICS (A)

注意 ☆試験時間は60分。

PLEASE NOTE: THE TEST PERIOD IS 60 MINUTES.

MATHEMATICS (A)

Nationality

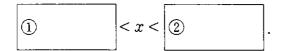
No.

(Please print full name, underlining family name)

Name

Marks

- 1 Fill in the blanks with the correct numbers.
 - (1) The solution of the inequality 4x-6 < 2x < 5x+3 is



(2) Assume that x-2 is a factor of the polynomial $f(x) = x^3 + ax^2 + bx + 2$ and that f(x) gives a remainder of -3 when it is divided by x+1. Then

$$a = \boxed{1}$$
 and $b = \boxed{2}$

(3) The graph of the function $y = x^2 + ax + 1$ touches to the x-axis if and only if

$$a = \boxed{1}$$
 or $\boxed{2}$

- (4) $(\log_2 3)(\log_3 4) + 3^{\log_3 5} =$
- (5) When $\tan A = \sqrt{2}$, then $\frac{\sin A + \cos A}{\sin A \cos A} =$

- 2 The circles $C: x^2 + y^2 + kx + (1+k)y (k+1) = 0$ pass through the same two points for every real number k.
 - (1) Find the coordinates of these two points.
 - (2) Find the minimum value of the radius of a circle C.

- 3 Take points $A\left(\frac{7}{2}, 0\right)$, $B\left(0, 7\right)$ and $C\left(-\frac{7}{6}, 0\right)$ on the xy-plane. The parabola $y = -x^2 + ax + b$ is tangent to both lines BA and BC.
 - (1) Determine a and b.
 - (2) Calculate the area of the domain bounded by the line BA, the parabola and the y-axis.