

2009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 2009

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.	
Name	(Please print full name, underlining family name)		
		Marks	

1 Fill in the following blanks with the correct answers.

(1) $(-2x^2y)^3 \div x^5y \div (-2x^2y^2) =$

(2) $\frac{\sqrt{5}}{\sqrt{3+1}} - \sqrt{\frac{30}{8}} + \frac{\sqrt{45}}{2} =$

(3) When $\frac{a}{x+1} - \frac{b}{2x+3} = \frac{x+4}{2x^2+5x+3}$ is an identical equation,

$a =$ $\textcircled{1}$ and $b =$ $\textcircled{2}$.

(4) There are four continuous odd numbers. When the total is 224,

the largest odd number is .

(5) The largest integer x that satisfies the inequality $8^x < \frac{1}{4}$

is $\textcircled{1}$.

The number of integers x that satisfy the inequalities $2 < \log_x 45 < 3$

is $\textcircled{2}$.

(6) When one of the solutions of equation $x^3 + ax^2 + x + 1 = 0$ is $x = 1$,

$a =$ $\textcircled{1}$ and other solutions are $x =$ $\textcircled{2}$.

(7) Under $90^\circ \leq \theta \leq 180^\circ$, when $\cos \theta = -\frac{1}{2}$, then $\theta =$ $\textcircled{1}$.

and when $\sin \theta = \frac{3}{5}$, then $\cos \theta =$ $\textcircled{2}$.

- (8) There are five numbers; 1, 2, 3, 4, 5.

How many three-digit integers can be made using three different numbers?

The answer is . Among them, there are

integers which are larger than 400.

- (9) Let vector $\vec{a} = (2, 3)$ and $\vec{b} = (-1, 4)$. When $\vec{x} - \vec{a} = \vec{b} - \vec{x}$, then

$\vec{x} = (\text{①}, \text{②})$.

- (10) Let $f(x) = -x^3 + 6x^2 - 9x + 1$.

(i) The derivative $f'(x) = \text{_____}$.

(ii) Under $0 \leq x \leq 3$, the minimum value of $f(x)$ is

2 There is a parabola A: $y = x^2 - 4x - 5$.

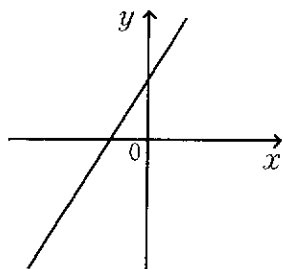
- (1) The coordinate of the vertex of the parabola A is ,
, and the x -coordinate of the intersection of the parabola
A and the x -axis is .

- (2) The equation of the parabola which moved the parabola A symmetrically
with the origin is $y = \text{_____}$.

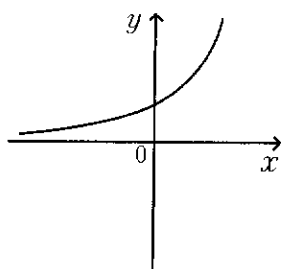
- (3) When a straight line B: $y = 2x + k$ touches the parabola A,

$k = \text{①}$, and then the area of the portion which is surrounded
by the parabola A, the straight line B, and the y -axis is .

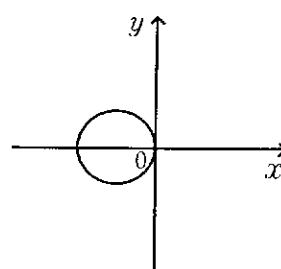
3 Choose equations showing the graphs which move the following graphs symmetrically with the y -axis, and choose the answers from those numbered from ① to ⑮.



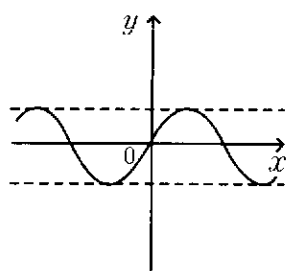
(1)



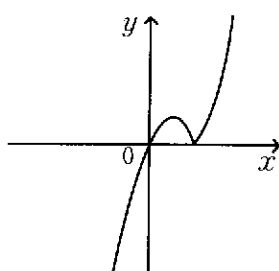
(2)



(3)



(4)



(5)

① $y = \sin x$

② $y = \cos x$

③ $y = -\sin x$

④ $3x + 2y - 2 = 0$

⑤ $3x - 2y + 2 = 0$

⑥ $3x + 2y + 2 = 0$

⑦ $y = |-x(x+1)|$

⑧ $y = -x|x+1|$

⑨ $y = |-x|(x+1)$

⑩ $x^2 + y^2 + 2x = 0$

⑪ $x^2 + y^2 - 2x = 0$

⑫ $x^2 + y^2 - 2y = 0$

⑬ $y = 2^x$

⑭ $y = \left(\frac{1}{2}\right)^x$

⑮ $y = \log_2 x$