2020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 (MEXT) SCHOLARSHIPS 2020

学科試験　問題

EXAMINATION QUESTIONS

(専修学校留学生)

SPECIALIZED TRAINING COLLEGE STUDENTS

数　　学

MATHEMATICS

注意☆試験時間は**６０分**。

PLEASE NOTE : THE TEST PERIOD IS **６０ MINUTES.**

(2020)

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

Note that all the answers should be written on the answer sheet.

1. Fill in the following blanks with the correct answers.

(1) $\dfrac{\sqrt{5}}{\sqrt{2}+1}-\dfrac{\sqrt{5}}{\sqrt{2}-1}=\boxed{}$.

(2) $\dfrac{x^2+1}{x^3+x^2}=\dfrac{\boxed{①}}{x}+\dfrac{\boxed{②}}{x^2}+\dfrac{\boxed{③}}{x+1}$ is an identity with respect to x .

(3) When $x^2-5x+1=0$, then $x+\dfrac{1}{x}=\boxed{①}$, $x^2+\dfrac{1}{x^2}=\boxed{②}$.

(4) When the function $y=x^2+ax+b$ takes the minimum value -1 at $x=-2$,

then $a=\boxed{①}$, $b=\boxed{②}$.

(5) Find the range of x that satisfies the following inequality

$\log_2 x+\log_{\frac{1}{2}}(x+1)>\log_2(x-2)$; $\boxed{①} < x < \boxed{②}$.

(6) Given a regular octagon. From eight vertexes, how many diagonal lines can be drawn ? The answer is $\boxed{}$.

(7) When $a, 8, b$ is a geometric progression and $a, b, -8$ is an arithmetic progression , then $a=\boxed{①}$, $b=\boxed{②}$ $(a>b)$.

(8) The radius of the inscribed circle of an equilateral triangle with a side length of 6 is $\boxed{}$.

(9) If $\displaystyle\sum_{k=1}^{n}\frac{1}{k(k+1)}=\frac{7}{8}$, then $n=\boxed{}$.

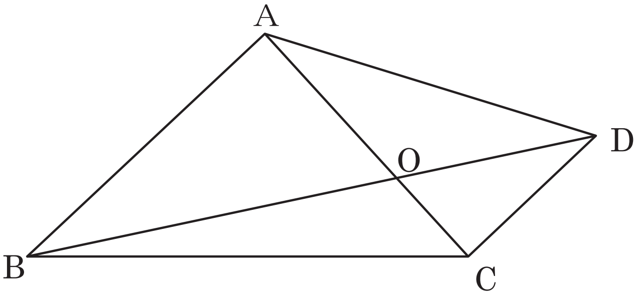
(10) When a differentiable function $f(x)$ satisfies the equation

$\displaystyle\int_a^x f(t)\,dt=x^2-2x+1$, then $f(x)=\boxed{①}$, $a=\boxed{②}$.

2. A trapezoid ABCD on a plane satisfies AB $=5$, BC $=6$, CD $=3$, AC $=4$ and AB//CD.

Let O denote the intersection of AC and BD.

Fill in the following blanks with the correct numbers.



(1) cos∠ABC = ☐ .

(2) BD = ☐ .

(3) The area of △ABC = ☐ .

(4) sin∠ACD = ☐ .

(5) The relationship between the areas of triangles ABO, BCO, CDO and DAO is

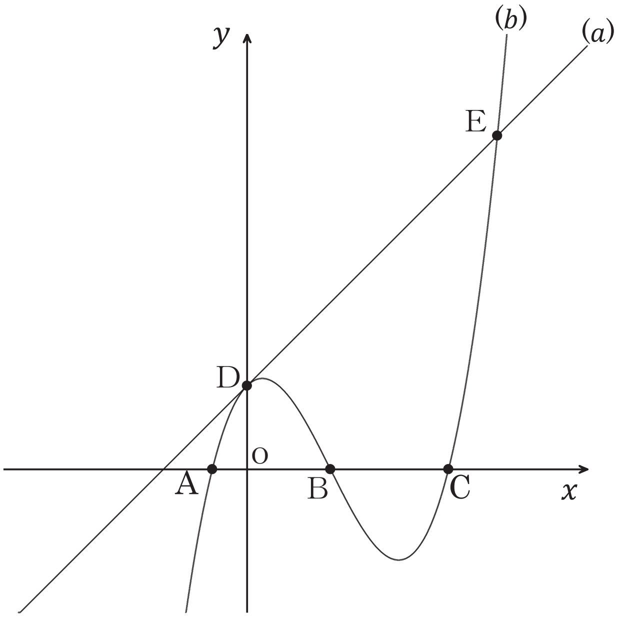
△ABO : △BCO : △CDO : △DAO = ① : 15 : ② : ③ .

(6) The scalar product of two vectors $\overrightarrow{CD} \cdot \overrightarrow{CA}$ = ☐ .

3. On the plane xy, there is the straight line(a) and the graph of the curve(b) ; $y = x^3 - 3x^2 + x + 1$ as shown in a lower figure.

The straight line(a) is the tangent to the curve(b) that passes through the point(1,2). Points A, B and C are the intersections of the curve(b) and x-axis. Point D is the point of tangency of the straight line(a) and the curve(b). Point E is the intersection of the straight line(a) and the curve(b).

Find the coordinates of points A, B, C, D and E.



A(① , ②)

B(① , ②)

C(① , ②)

D(① , ②)

E(① , ②)