香 港 考 試 局

HONG KONG EXAMINATIONS AUTHORITY

一 九 八 〇 年 香 港 中 學 會 考

HONG KONG CERTIFICATE OF EDUCATION EXAMINATION 1980

附加數學 試卷一

二小時完卷

上午八時三十分至十時三十分

本試卷必須用英文作答

ADDITIONAL MATHEMATICS PAPER I

Two hours

8.30 a.m.—10.30 a.m.

This paper must be answered in English

Answer ALL questions in Section A and any THREE questions from Section B .

All working must be clearly shown.

SECTION A (40 marks)

Answer ALL questions in this section.

1. Find the range of values of k for which the equation

$$2x^2 + x + 5 = k(x+1)^2$$

has no real roots. (5 marks)

2. Find $\lim_{\Delta x \to 0} \frac{1}{\Delta x}\left[\frac{2x+3+2\Delta x}{x+4+\Delta x} - \frac{2x+3}{x+4}\right]$ (5 marks)

3. A triangle is formed by the three straight lines

L_1 : $6x + y + 3 = 0$,

L_2 : $x + 2y + 1 = 0$,

L_3 : $10x + 6y - 9 = 0$.

Find the equation of the altitude of the triangle which is perpendicular to L_3. (6 marks)

4. Find $\int \frac{2}{\cot\frac{x}{2} + \tan\frac{x}{2}}\,dx$. (6 marks)

5. Given that $\frac{\sin^2 A}{1 + 2\cos^2 A} = \frac{3}{19}$, where $90° < A < 180°$,

find the value of $\frac{\sin A}{1 + 2\cos A}$. (6 marks)

6. Solve the inequality

$$x^2 - |x| - x < 0.$$

(6 marks)

7. Find the general solution of

$$\tan 7\theta + \cot 2\theta = 0.$$

(6 marks)

SECTION B (60 marks)

Answer any THREE questions from this section.
Each question carries 20 marks.

8. A solid right circular cone of volume V cubic metres and base radius r metres has a total surface area of π square metres.

(a) Express V^2 in terms of r.

(b) Using differentiation, find the value of r for which V^2 is a maximum.

Hence, or otherwise, find the maximum value of V.

(c) Sketch the graph of V^2 against r.

9. (a) Given that $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$, show that

$$\tan 3\theta = \frac{\tan^3\theta - 3\tan\theta}{3\tan^2\theta - 1}.$$

(b) Let $f(x) = 3x^3 + mx^2 - 9x + n$, where m and n are integers.

When $f(x)$ is divided by $x - 1$, the remainder is -8.

When $f(x)$ is divided by $x - 2$, the remainder is -5.

(i) Show that $m = -3$ and $n = 1$.

(ii) By putting $x = \tan\theta$ and using the result in (a), or otherwise, solve the equation $f(x) = 0$.
(Correct your answer to 2 decimal places.)

10. Given: $z = x + yi$, where x and y are real numbers and $i^2 = -1$.

(a) Find a relation between x and y if the modulus of $[z - (3+4i)]$ is 4.

(b) Find a relation between x and y if the amplitude of $\frac{z-1}{z+1}$ is $\frac{\pi}{2}$.

(c) Find the complex number z_1 which satisfies both the conditions given in (a) and (b). Furthermore, if $z_1 = (p + qi)^2$, where p and q are real numbers, find the value of the product pq.

11. O, A, B are the points (0, 0), (10, 4), (5, 10) respectively.
C is a point on OB such that $OC : CB = 1 : r$ and
D is a point on OA such that $OD : DA = r : 1$, where $r > 0$.

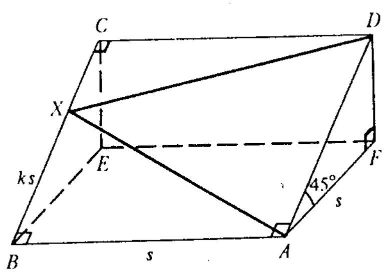
(a) Express the coordinates of C and D in terms of r.

(b) Express the area of ΔODC in terms of r.

(c) If the area of ΔODC is k times the area of ΔOAB, express r in terms of k.
Hence, or otherwise, show that $k \leqslant \frac{1}{4}$.

(d) Using the result in (c), or otherwise, find the maximum area of ΔODC.

12. The figure shows a path AXD on the inclined plane $ABCD$. AX and XD are straight lines. The inclined plane is at 45° to the horizontal plane $ABEF$. Let $AB = AF = s$, $BX = ks$, and α be the angle between AX and the horizontal.



(a) Express the length of AX in terms of s and k.

(b) Express $\sin\alpha$ in terms of k.

(c) If the inclination of AX to the horizontal is not to exceed 30°, find the range of values of k.
Hence, or otherwise, determine the range of values of k so that each of the inclinations of AX and XD to the horizontal does not exceed 30°.

END OF PAPER

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附加數學
試卷二

二小時完卷

上午十一時十五分至下午一時十五分

本試卷必須用英文作答

ADDITIONAL MATHEMATICS
PAPER II

Two hours

11.15 a.m.—1.15 p.m.

This paper must be answered in English

Answer ALL questions in Section A and any THREE questions from Section B.

All working must be clearly shown.

SECTION A (40 marks)

Answer ALL questions in this section.

1. Expand $(1 + 2x)^3 (1 + 3x)^4$ in ascending powers of x as far as the term containing x^2.
(5 marks)

2. Using the substitution $u = x - 1$, find the indefinite integral $\int (x + 2)\sqrt{x - 1}\, dx$.
(5 marks)

3. Find the slope of the tangent to the curve

$$2x^2y + x^2 + y^2 - 4 = 0$$

at the point (2, 0).

(6 marks)

4. If $y = \cos(\sin x)$, find $\frac{d^2y}{dx^2}$.

(6 marks)