2018-DSE MATH EP M2

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2018

MATHEMATICS Extended Part Module 2 (Algebra and Calculus) Question-Answer Book

 $8:30 \text{ am} - 11:00 \text{ am} (2\frac{1}{2} \text{ hours})$ This paper must be answered in English

INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7, 9, 11 and 13.
- (2) This paper consists of TWO sections, A and B.
- (3) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (4) Graph paper and supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.
- (5) Unless otherwise specified, all working must be clearly shown.
- (6) Unless otherwise specified, numerical answers must be exact.
- (7) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

©香港考試及評核局 保留版權 Hong Kong Examinations and Assessment Authority All Rights Reserved 2018

_

Candidate Number



$$\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$cos(A \pm B) = cos A cos B \mp sin A sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$2\sin A\cos B = \sin (A+B) + \sin (A-B)$$

$$2\cos A\cos B = \cos(A+B) + \cos(A-B)$$

$$2\sin A\sin B = \cos(A - B) - \cos(A + B)$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2}$$

$$\sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2}$$

$$\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

SECTION A (50 marks)

Answers written in the margins will not be marked.

l	1.	Let $f(x) = (x^2 - 1)e^x$. Expre	ss $f(1+h)$ in terms of h	. Hence, find $f'(1)$	from first principles.
					(4 marks)

Please stick the barcode label here.

Expand $(x+3)^5$. Hence, find the c			(x)	
				w
				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
				uman a banan madam
		and the second statement of the second secon	ad 1 america (1 a a a a a a a a a a a a a a a a a	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

	and the second s			
		Non-time and the state of the s		.,

(a)	If $\cot A = 3 \cot B$, prove that $\sin(A+B) = 2\sin(B-A)$.	
(b)	Using (a), solve the equation $\cot\left(x + \frac{4\pi}{9}\right) = 3\cot\left(x + \frac{5\pi}{18}\right)$, where $0 \le x \le \frac{\pi}{2}$.	(5 mar
Samuel		
orthogon comm. 6444000		
300,000,000		
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
		21 (122) 17 (2) 2) 2 (2
		.,,
2.111.111111111111111111111111111111111		
100 500 1334 500 1444 1455		
;====i		
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

Please stick the barcode label here.

(a)	Using integration by parts, find $\int u(5^u) du$.
(b)	Define $f(x) = x(5^{2x})$ for all real numbers x . Find the area of the region bounded by the grap of $y = f(x)$, the straight line $x = 1$ and the x -axis.
	(6 mark
353004417073633177400	
3.00.00	
(4600) ((460,0)7) ((100	
10000000	
30030000000000000000000000000000000000	
Harden Brown (com	
HAMAPAR III II A	
11 10 10 10 10 10 10 10 10 10 10 10 10 1	
1945000011111000004410440	
100000000000000000000000000000000000000	

(b)	At any point (x, y) on the curve Γ , the slope of the tangent to Γ is $15x^3\sqrt{1+x^2}$
(-)	The y-intercept of Γ is 2. Find the equation of Γ . (7 ma

(e.an.)))(e.an.))	
THE STATE OF THE S	

Please stick the barcode label here.

			arport opposite and the second control of
300 - 11 11 11 11 11 11 11 11 11 11 11 11 1			
			aren (1 abro - 1 a a a a a a a a a a a a a a a a a a
		*	

(a)	Using mathematical induction, prove that	$\sum_{k=1}^{n} k(k+4) = \frac{n(n+1)(2n+13)}{6}$	for all positiv
	integers n .		
(b)	Using (a), evaluate $\sum_{k=333}^{555} \left(\frac{k}{112}\right) \left(\frac{k+4}{223}\right).$		
	K-333		(7 marks

100-200,00000000000000000000000000000000			
10.000.000.000.000.000			
Managara			
4			
Olassia (Olassia (V.)			
4-480000 1-641-1-1-1-1-1-1			

Please	stick	the	barcode	label here.	

	2	
Milit British Land Sangaran Add Maria (Add Land and Add Land Add Land and		
SHATES IN THE THE SHATES S		

(a)	Express b and c in terms of a .
(b)	Prove that X is a non-singular matrix.
(c)	Denote the transpose of X by X^T . Express $(X^T)^{-1}$ in terms of a .

2774444334444444444444444	
(*************************************	
ones de spessor de service de	

	·

10

Please stick the barcode label here.

				BOTTO OF THE PARTY
			Mary (Constitution of Mary Constitution of Mary Constitution of Mary Constitution of Mary Constitution of Mary	the state of the second st
				personal designation of the second designati

STATE OF THE PROPERTY OF THE P				
				Maria Disputation Company of the Control of the Con
The state of the s	aunium julia ang mang mang mang mang mang mang mang			**************************************
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		(25)

-i
be marked
土
na
п
96
-
10
=
\equiv
>
S
=
pD
ar
margins v
0
the
п
-
ten
Ĕ
I
3
S
er
SW
S
Answ
4

	ne $f(x) = \frac{A}{x^2 - 4x + 7}$ for all real numbers x, where A is a constant. It is given that the extreme
valu	e of $f(x)$ is 4.
(a)	Find $f'(x)$.
(b)	Someone claims that there are at least two asymptotes of the graph of $y = f(x)$. Do you agree? Explain your answer.
(c)	Find the point(s) of inflexion of the graph of $y = f(x)$. (8 marks)
30-00-1	

1800441110011118	

S12.00.00	
1.000-000-01-0-0-0-0-0-0-0-0-0-0-0-0-0-0	

Please stick the barcode label her	Please	stick	the	barcode	label	here
------------------------------------	--------	-------	-----	---------	-------	------

Mahadiahada da Mahadiahadi Mahadiahadi Mahadiahadi Mahadiahadi Mahadiahadi Mahadiahadi Mahadiahadi Mahadiahadi	
	5

	SECT	TION I	3 (50 marks)	
	9.		der the curve $C: y = \ln \sqrt{x}$, where $x > 1$. Let P be a moving point lying on C . The normal at P cuts the x -axis at the point Q while the vertical line passing through P cuts the x -axis at the R .	
		(a)	Denote the x-coordinate of P by r. Prove that the x-coordinate of Q is $\frac{4r^2 + \ln r}{4r}$. (3 marks)	
		(b)	Find the greatest area of ΔPQR . (5 marks)	
		(c)	Let O be the origin. It is given that OP increases at a rate not exceeding $32e^2$ units per minute. Someone claims that the area of ΔPQR increases at a rate lower than 2 square units per minute when the x-coordinate of P is e . Is the claim correct? Explain your answer. (4 marks)	
narked.		***************************************		narked.
Allawers without in the margins will not be marked				not be n
SIIIS WIII				Answers written in the margins will not be marked.
uic illai				the marg
III II III				ritten in
SWCIS W				swers w
				An
		(1- 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		
		34************************************		

1414 (ANTHORNE SAFE			A CONTRACTOR OF THE PROPERTY O					
	aneryo e e e e e e e e e e e e e e e e e e e				 			

			.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		 ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			

inga sa								
					 ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
			adaya waxaa da ahaa ahaa ahaa ahaa ahaa ahaa ah		 			
, processor					 			
1980/1000/00								***************************************
***************************************				***************************************				
3644,10000011								
***************************************					 	-/		
					 ,	***************************************	***************************************	
			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		 3)	***************************************	20074-14000-1414-1414-1414-1414-1414-1414	
		·			 			

Go on to the next page

	On occurred to the control of the co			

				emore annue :

				Marie 1862 - 1863, 1994 - 1867 - 1
	9			
			ii	

7.2
ced
marke
be n
not b
u
WI
margins
OT.
ar
the m
in the
in the
the
in the
ers written in the
in the

10.	(a)	(i)	Prove that $\int \sin^4 x dx = \frac{-\cos x \sin^3 x}{4} + \frac{3}{4} \int \sin^2 x dx$.	
		(ii)	Evaluate $\int_0^{\pi} \sin^4 x dx .$	(5 1-)
				(5 marks)
	(b)	(i)	Let $f(x)$ be a continuous function such that $f(\beta - x) = f(x)$ for all real numbers β is a constant. Prove that $\int_0^\beta x f(x) dx = \frac{\beta}{2} \int_0^\beta f(x) dx$.	umbers x,
		(ii)	Evaluate $\int_0^{\pi} x \sin^4 x dx .$	
				(5 marks)
	(c)	Consi	ider the curve $G: y = \sqrt{x} \sin^2 x$, where $\pi \le x \le 2\pi$. Let R be the region bound	nded by G
		and the x-	he x-axis. Find the volume of the solid of revolution generated by revolving axis.	R about (3 marks)

	(1000)001101000			
		TIL THE SHAPE OF T		
			,	

			•	

10341411111	
offered and an	

(1) (1) (1) (1) (1)	
programmed a price	557-24 13 -715-2-4110-000
anico de m	
	10-3401 (0000) (00100)

10010001166000	

17110-48111111	***************************************
00000 0000	
(Santana Personal	

	.,.,
No. 110.000 (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00) (10.00)	
	rateriory reservation

Management				
		······································		

(E):
$$\begin{cases} x + ay + 4(a+1)z = 18 \\ 2x + (a-1)y + 2(a-1)z = 20 \text{, where } a, b \in \mathbb{R} \\ x - y - 12z = b \end{cases}$$

- (i) Assume that (E) has a unique solution.
 - (1) Find the range of values of a.
 - (2) Solve (E).
- (ii) Assume that a = 3 and (E) is consistent.
 - (1) Find b.
 - (2) Solve (E).

(9 marks)

Answers written in the margins will not be marked.

(b) Consider the system of linear equations in real variables x, y, z

(F):
$$\begin{cases} x + 3y + 16z = 18 \\ x + y + 2z = 10 \\ x - y - 12z = s \end{cases}$$
, where $s, t \in \mathbb{R}$.

Assume that (F) is consistent. Find s and t. (3 marks)

22

Marie Committee of the					
					Marghan Marghan Commit
WITH BUILDING TO THE TOTAL	 				

**************************************	 ***************************************				
STATES THE STATE OF THE STATES					M. 1000 1000 1000 1000 1000 1000 1000 10
			***************************************	***************************************	
30°00°00000000000000000000000000000000					
			1000		
					o Orienta (araba)
					A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

		MILITER AL LOCAL MARKET MA			
					H HILLIAN I LANGE AND
					Harris Market Charges
		h			
,110.011.01.01.01.01.01.01.01.01.01.01.01		2.			

30001300011100001110001110001110001110001110001110001110001110001110001110001110001110001110001110001110001110		

MATTERS TO SECTION OF THE SECTION OF		
THE COLUMN TO TH		

	According to the second se	 	 	
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		 	
				.,,

	Management of the second of th			
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	 	
erannag (hannon-dagankagake (2005) de de Paris de				
100001111001111100111110011111111111111	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			

	 1161A1 3.21((1794A11164H1 (1797)))))))))))))))))))		

	 		 .,
	 		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,			
		,	
A			

200			 				

		 		= 1			
						o114480441574111111111111111111111111111111111	
*****			MAN-WITT 1 100-10 MAN-100 p. / (200-11 1 200)				
****		· / (2000)	 				

	641114 decr. 1000 de 1911 de 1	 	 				
	,						
and replication in the contraction of the contracti		 	 ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		B.1. 1. 1. 1. 1. 1. 1. 1.		0.752-0.464-0-0-1,114-0-0-6-1-7-1,00-6-1-1-1-4-0-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1
				B 18 11 1 18 19 1 1 1 1 1 1 1 1 1 1 1 1 1	***************************************		
Aging	#*************************************	 	 				

atom to							
-		 	 				
pose	***************************************	 					
			 	······································			
FEEDER		 	 				
