

## **FACULTY OF SCIENCE**

## DEPARTMENT OF APPLIED PHYSICS AND ENGINEERING MATHEMATICS

NATIONAL DIPLOMA: ANALYTICAL CHEMISTRY DIPLOMA IN ANALYTICAL CHEMISTRY (4 YEARS)

MODULE

MAT2WA2/MAT1YE3

**ENGINEERING MATHEMATICS 2A** 

CAMPUS

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ANSWER CORRECTLY.

## JULY SUPPLEMENTARY EXAMINATION

				C. E. C. WILLY		
DATE 20/07/2018					SESSION	08:00 - 10:00
ASSESSOR					MRTEM	IOGOROSI
INTERNAL MODE	RATOR				MR IK LE	ETLHAGE
DURATION 2 H	IOURS				MARKS	70
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REQUIREMENTS :				IFIC CALCULATO	PR	
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: USE ONLY BLUE OR BLACK INK TO WRITE. NO PENCIL

QUESTION 1	[14]

Determine the indicated derivative. Write the answer in its simplest form or, where applicable, give the answer correct to two decimal places.

1.1	$f'(x)$ if $f(x) = \frac{x}{\sqrt{1 - 4x^2}}$	(3)
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1.2	$\frac{dy}{dx}$ if $y = (x+1)\sqrt{x^2+2x} - \cosh^{-1}(x+1)$ ,	(4)
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1.3 Find $\frac{d^2y}{dx^2}$ in its simplest form if $y = \ln(x^3) + (\ln x)^3$	(3)
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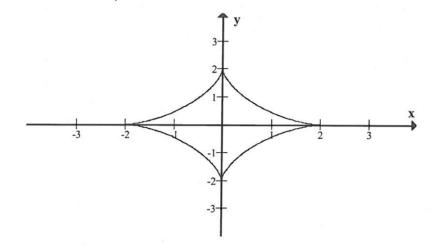
$1.4 \frac{d^2 y}{dx^2} \text{ if } y = \sqrt{x} \sin \sqrt{x}$	(4)
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QUESTION 2	[5]
Use implicit differentiation to determine	$\frac{d^2y}{dx^2}$ at the point (2;-1), if $x^2 + 4xy + y^2 + 3 = 0$ .

QUESTION 3 [5]
Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = \frac{e^{x^2} \cos e^x}{\sqrt{\sin^{-1} x}}$ . Write the answer in its
simplest form.

QUESTION 4 [5]

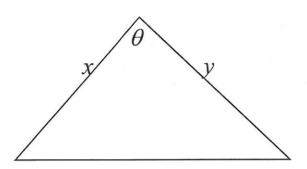
The hypocycloid of four cusps is defined parametrically by  $x=a\cos^3\theta$ ,  $y=a\sin^3\theta$ . It is shown below. Find  $\frac{d^2y}{dx^2}\Big|_{\theta=\frac{\pi}{4}}$  if a=2.



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QUESTION 5		[15
5.1 If $z = \frac{y^2}{(x^2 + y^2)} - \ln(x^2 + y^2)$ determine	$\frac{\partial^2 z}{\partial y \partial x}$ in its simplest form.	(5)
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5.2 A surveyor wants to calculate the area of a triangular field. She measures two adjacent sides and finds that the one side has length x = 50m and the other side has length y = 75m. Each of these measurements has a possible error of 0.2m. She measures the angle between the two sides and finds that it is  $\theta = 30^{\circ}$ , with a possible error of  $0.23^{\circ}$ . Find the maximum error in the calculation of the area, A, of the field. The area is given by  $A = \frac{1}{2}xy\sin\theta$ . (5)



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5.3 The paraboloid with equation  $z = 12 - 4x^2 - y^2$ , find the rate of change in z in the

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QUESTION 6	[29]
Evaluate the following integrals. Show all the steps of integration.	
$6.1 \int \cos ec^6 x dx$	(4)

$5.2 \int \frac{x+1}{9x^2+4} dx$	(3)
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	(4)
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$6.3 \int_{0}^{\frac{\pi}{6}} \sqrt{1 + \cos 2\theta}  d\theta$	(4)
0	<u> </u>
$3.4 \int 3^{\log_3 \frac{x^2}{\sqrt{x^6 - 1}}} dx$	(3)

$\int \frac{1}{5 + e^{5t}} dt$	(3
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$\int_{0}^{\infty} e^{\sqrt{1+\frac{1}{x}}}$	
$6.6 \int \frac{e^{\sqrt{1+\frac{1}{x}}}}{\sqrt{x^4 + x^3}} dx$	(4)
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6.7 $\int \frac{3}{\sqrt{x^2 + 1} \cdot \left(1 + \left[\sinh^{-1} x\right]^2\right)} dx$	(4)
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6.8	$\int \frac{\sec^2 2x}{\sqrt{1 - 16\tan^2 2x}} dx$	(4)
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MARKS AVAILABLE : 73
TOTAL MARKS : 70

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