# FUKIEN SECONDARY SCHOOL S5 First Term Uniform Test (2021-2022) Mathematics Extended Part Module 2 (1 hour 15 minutes)

Date: 12<sup>th</sup> November 2021 Time: 8:30a.m. - 9:45a.m.

### Instructions to students:

- 1. This paper consists of TWO sections, A and B.
- 2. Attempt ALL questions in Section A and Section B.
- 3. Write your answers in the spaces provided.
- 4. Unless otherwise specified, show your workings clearly.
- 5. Unless otherwise specified, numerical answers must be exact.
- 6. The diagrams in this paper are not necessarily drawn to scale.

Name:\_\_\_\_\_ Class:\_\_\_\_\_ No.:\_\_\_\_\_

#### FORMULAS FOR REFERENCE

$\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B$	$\sin A + \sin B = 2\sin \frac{A+B}{2}\cos \frac{A-B}{2}$
$\cos (A \pm B) = \cos A \cos B \mp \sin A \sin B$	$\sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$
$\tan (A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$	$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2}$
$2\sin A\cos B = \sin (A+B) + \sin (A-B)$	$\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$
$2\cos A\cos B = \cos (A+B) + \cos (A-B)$	
$2\sin A\sin B = \cos (A - B) - \cos (A + B)$	

## Section A (31 marks)

1. Find the following indefinite integrals.

(a) 
$$\int \left(x - \frac{2}{x}\right)^3 dx$$
 (b)  $\int \frac{x^{\frac{3}{2}} - 8}{\sqrt{x} - 2} dx$ 

(4 marks)

2. Find the following indefinite integrals.

(a) 
$$\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx$$
 (b) 
$$\int e^{2x} \sqrt{2e^x + 1} dx$$
 (12 marks)  
(c) 
$$\int \sin 2x \sin 3x \sin 5x dx$$
 (d) 
$$\int \frac{\cos^5 x}{\sin^6 x} dx$$

 4.

Using integration by parts, find  $\int x \cdot 7^x dx$ . 3.

		(5 marks)
(a)	Rewrite $4x - x^2$ in the form of $b - (x - a)^2$ , where a and b are positive constants.	
	dx	
(b)	Hence find $\int \frac{du}{\sqrt{4u} u^2}$ .	
	$\sqrt{4x-x}$	/ <b>-</b>
	$\sqrt{4x-x}$	(5 marks)
	√4 <i>x</i> − <i>x</i>	(5 marks)
	$\sqrt{4x-x}$	(5 marks)
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	$\sqrt{4x-x}$	(5 marks)
	√4 <i>x</i> − <i>x</i>	(5 marks)
	√4 <i>x</i> − <i>x</i>	(5 marks)
	V4x-x	(5 marks)
	√4 <i>x</i> − <i>x</i>	(5 marks)
	V4x-x	(5 marks)
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	(5 marks)
	V4x-x	(5 marks)

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5. In Figure 1, water is poured into an empty cylindrical vessel of base radius 8 cm and height 26 cm. If the water level *h* cm is rising at a speed  $\left(1 + \frac{1}{t+1}\right)$  cm/s when pouring water into the vessel for *t* seconds, find the volume of water in the vessel after 3 seconds. (5 marks)



Figure 1


## Section B (17 marks)

- 6. Let g(x) be a continuous function defined on  $\mathbb{R}^+$ , where  $\mathbb{R}^+$  is the set of positive real numbers. It is given that  $g'(x) = \frac{2x^2 3x + 2}{x}$  for all x > 0.
  - (a) Is g(x) a decreasing function? Explain your answer.
  - (b) Denote the curve y = g(x) by G. It is given that G passes through the point (1, 3).
    - (i) Find the equation of G.
    - (ii) Find the point(s) of inflexion of *G*.

(8 marks)

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7. Initially, a particle moves with a velocity of 3 m/s along a straight line and the acceleration

after t seconds is  $\frac{1}{(t+1)^2}$  m/s<sup>2</sup>.

- (a) Find the distance travelled by the particle in the first *t* seconds in terms of *t*.
- (b) Find the distance travelled by the particle in the 4th second.

(9 marks)

End of Test		