FUKIEN SECONDARY SCHOOL

S5 First Term Uniform Test (2020-2021)

Mathematics Extended Part Module 2

(1 hour 15 minutes)

Date: 23rd October 2020 Name:____________________

Time: 8:30a.m. - 9:45a.m. Class:________ No.:_______

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.

FORMULAS FOR REFERENCE

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

Section A (35 marks)

1. Find the following indefinite integrals. (17 marks)

(a) $\int (3x^5 + \sqrt{2}x + 1)dx$ (b) $\int 2^{3-5x}\,dx$ (c) $\int \tan^7 x \sec^4 x\,dx$

(d) $\int \frac{dx}{(1+8x^2)^2}$ (e) $\int x(\sin x - \cos x)\,dx$ (f) $\int \sin^2 x\ \cos^4 x\,dx$

2. (a) Find $\frac{d}{dx}(x^3 \ln x)$.

(b) Hence, find $\int x^2 \ln x \, dx$.

(4 marks)

3. (a) Using integration by parts, find $\int e^{x} \sin \pi x \, dx$.

(b) Hence, find $\int e^{3-x} \sin \pi x \, dx$.

(5 marks)

4. It is given that $(1+ax)^8 = \sum_{r=0}^{8} \beta_r x^r$, where a is a negative constant. If $\beta_2 : \beta_6 = 1:16$,

(a) find the value of a,

(b) find $\int \sum_{r=0}^{8} \beta_r x^r dx$.

(5 marks)

5. The slope at any point (x, y) of a curve is $\frac{e^x}{e^x + 1}$. If the y-intercept of the curve is $\ln 4$, find the equation of the curve. (4 marks)

Section B (15 marks)

6. Figure 1 shows the curve $C: x^2 - \frac{y^2}{4} = 1$, where $x > 1$ and $y > 0$. $P(u, v)$ is a moving point on C. Q is a point on the x-axis such that $PQ \perp OQ$. It is given that OP is decreasing at a rate of 3 unit/s.

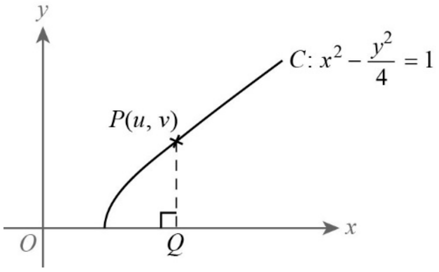

Figure 1

(a) Find the rate of change of OQ when $u = 5$.

(b) Find the rate of change of the area of $\triangle OPQ$ when $u = 5$.

(6 marks)

7. Consider the curve $y = -2x + 1 + \dfrac{5}{x-2}$.

(a) Find the x-intercepts and the y-intercept of the curve.

(b) Find the turning points of the curve.

(c) Find the asymptotes to the curve.

(d) Sketch the curve.

(9 marks)

—End of Test—