

Class	Register Number	Name
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南洋女子學校
Nanyang Girls' High School

**End-of-Year Examination 2021
Secondary 4**

ADVANCED MATHEMATICS

Monday 4 October

**1 hour
1245 – 1345**

READ THESE INSTRUCTIONS FIRST

1. Write your name, register number and class on all the work you hand in.
2. Write in dark blue or black ink.
3. You may use an HB pencil for any diagrams or graphs.
4. Do not use staples, paper clips, glue or correction tape/fluid.
5. Write your answers and working on the separate writing paper provided, unless otherwise stated.
6. Answer **all** questions.
7. Omission of essential working will result in loss of marks.
8. The use of an approved scientific calculator is expected, where appropriate.
9. If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degree to one decimal place. For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .
10. At the end of the examination, fasten all your work securely together.
11. The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **3** printed pages and **1** blank page.

Setter: A. Low

NANYANG GIRLS' HIGH SCHOOL

[Turn over

- 1 It is given that $y = \frac{3x}{\sqrt{4-x^2}}$.
- (a) Find $\int y \, dx$. [2]
- (b) Express y in ascending powers of x up to and including the x^5 term and state the range of values of x for which the expansion is valid. [4]
- 2 The equation of a curve is $3y^2 = 4x^3 + 5$.
- (a) Find the gradient of the normal to the curve at the point where $y = \sqrt{3}$. [3]
- (b) Find an expression for $\frac{d^2y}{dx^2}$ in terms of x and y . [3]
- 3 Find the volume generated when the area bounded by the curve $y = 3\ln 2x$ and the y -axis from $y = 4$ to $y = 5$ is rotated through one revolution about the y -axis.
Give your answer in exact form. [3]
- 4 It is given that $\mathbf{u} = 2\mathbf{i} + 4\mathbf{j} + 9\mathbf{k}$ and $\mathbf{v} = a\mathbf{j} + 3a\mathbf{k}$ where a is a constant.
- (a) Find the acute angle between $\mathbf{u}$ and $\mathbf{v}$. [2]
- (b) Given that $\mathbf{u} \times \mathbf{v}$ is a unit vector, find the possible values of a . [3]
- 5 The first and third terms of an arithmetic progression are equal to the first and third terms of a geometric progression. The common difference of the arithmetic progression is also equal to the common ratio of the geometric progression. It is known that the ninth term of the arithmetic progression is equal to the fifth term of the geometric progression. Given that the common ratio of the geometric progression is positive, find
- (i) the first term and the common difference of the arithmetic progression, [5]
- (ii) the sum of the first nine terms of the geometric progression giving your answer in the form $a + b\sqrt{3}$. [3]

- 7 Find $\int e^{2x} \cos 3x \, dx$. [4]

END OF PAPER

Answer Key

1(a) $-3\sqrt{4-x^2} + c$
 (b) $\frac{3}{2}x + \frac{3}{16}x^3 + \frac{9}{256}x^5 + \dots, |x| < 2$

2(a) $-\frac{\sqrt{3}}{2}$
 (b) $\frac{4xy^2-4x^4}{y^3}$

3 16.1 cubic units

4(a) 12.7°
 (b) $a = \pm \frac{1}{7}$

5(i) The first term is $\sqrt{3}$. The common difference is $\sqrt{3}$.
 (ii) $120 + 121\sqrt{3}$

6(a)(i) 518400
 (ii) 5940
 (iii) 720
 (b) $\frac{10}{13}$

7 $\frac{3}{13}e^{2x} \sin 3x + \frac{2}{13}e^{2x} \cos 3x + c$