

THIS PAGE IS FOR TEACHER USE ONLY:

Student Name:



St George Girls High School

# Mathematics Advanced

## 2021 Year 12 HSC Assessment Task 4

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### General

### Instructions

- Working Time – 50 minutes.
- No reading time.
- Write using black pen.
- Calculators approved by NESA may be used.
- You can use your reference sheet.
- To answer the questions
  - Answer each question on a separate A4 sheet of paper, which includes your full name, teacher's name and question number.
  - Show relevant mathematical reasoning and/or calculations.
  - Marks may not be awarded for incomplete or poorly presented solutions.

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### Total marks:

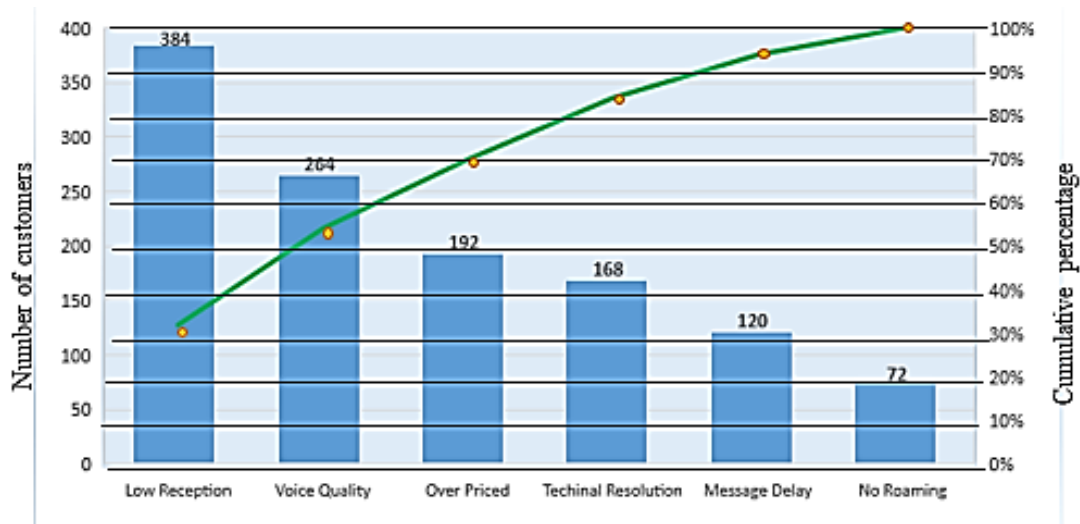
37

- Attempt Questions 1 – 6

Q1	/6
Q2	/5
Q3	/6
Q4	/7
Q5	/6
Q6	/7
<b>Total</b>	<b>/37</b>
	%

**Question 1 (6 marks)**

- a) Customers of Pronto Mobiles gave reasons for being unhappy with the company. The Pareto chart shows the data collected.



Approximately what percentage of the customers were unhappy because the service was Over Priced? 1

- b) Find

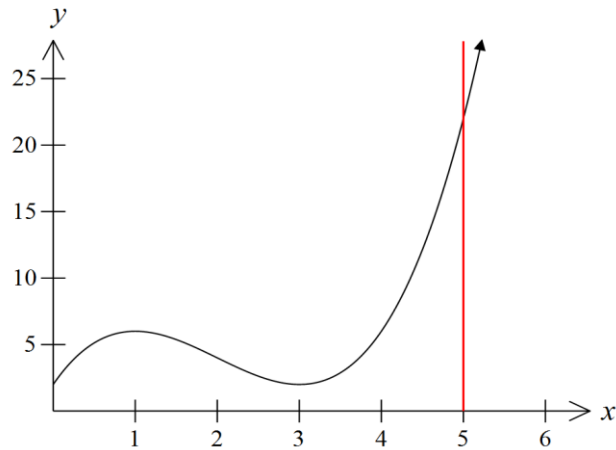
(i)  $\int 5e^{3x} dx.$  1

(ii)  $\int \frac{\sin(4x-9)}{4} dx.$  2

c) Find  $\int \frac{x+4}{x^2+8x+7} dx.$  2

**Question 2 (5 marks)**

- a) The diagram below shows the graph of  $y = x^3 - 6x^2 + 9x + 2$  and the line  $x = 5$ .

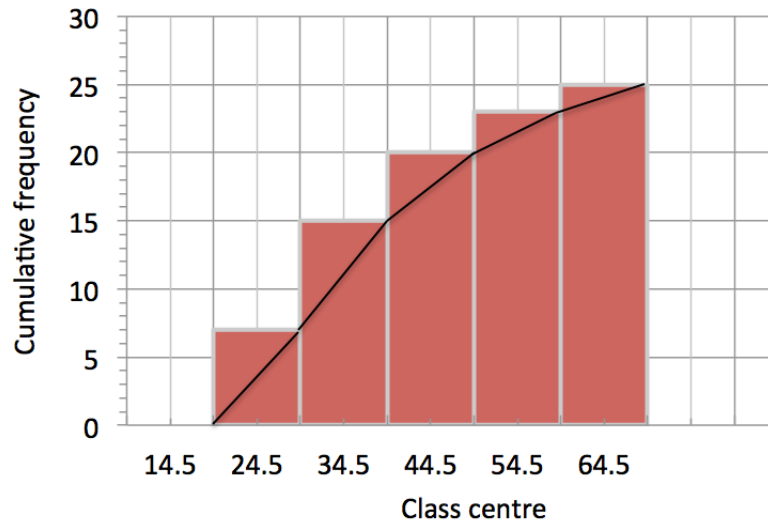


What is the area bounded by the  $x$ -axis and the curve  $y = x^3 - 6x^2 + 9x + 2$  between  $0 \leq x \leq 5$ ? 3

- b) i) Differentiate  $\ln(\sin x)$ . 1  
ii) Hence find  $\int \cot x \, dx$ . 1

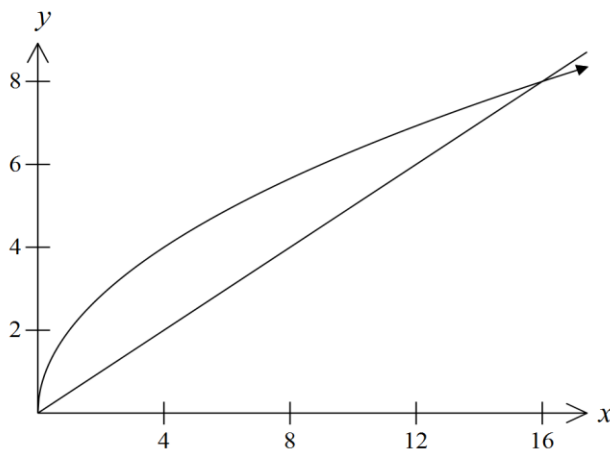
**Question 3 (6 marks)**

- a) The cumulative frequency graph below displays the test results from a random sample of students.



- i) How many students were in the 44.5 class? 1
- ii) Estimate the median test result? 1

- b) The diagram below shows the graphs of  $y = 2\sqrt{x}$  and  $y = \frac{x}{2}$ .



- i) Show that a point where the two curves meet is (16, 8). 2
- ii) Find the area between the two curves. 2

**Question 4 (7 marks)**

- a) Find the area bounded by the curve  $y = 5\sqrt{x}$ , the line  $y = 10$  and the  $y$  – axis. 3

- b) The gradient of a curve is given by  $\frac{dy}{dx} = 4 \sec^2 x$ . The curve passes through the point  $(\frac{\pi}{4}, 2)$ . 2

What is the equation of the curve?

- c) Find  $\int_{-2}^{-1} x(x^2 + 1)^3 dx$ . 2

**Question 5 (6 marks)**

- i) A function is defined by  $f(x) = 3^x + 2$ . Copy and complete the table of values below. 1

$x$	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
$f(x)$					

- ii) Use the trapezoidal rule with all the above function values to estimate the value of  $\int_0^4 (3^x + 2) dx$  correct to three decimal places. 2

- iii) Integrate to find the value of  $\int_0^4 (3^x + 2) dx$  correct to three decimal places. 2

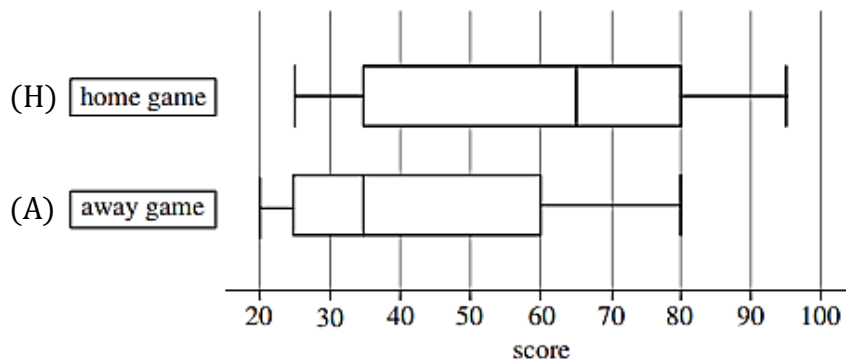
- iv) Why would you expect the value of the integral to be less than the approximation? (A diagram may prove useful.) 1

**Question 6 (7 marks)**

A local basketball team played 23 home games and 23 away games.

The home game (H) scores are the scores that the team made during games at their own basketball court; the away game (A) scores are the scores that the team made during games at opponents' courts.

The scores from each game are represented in the boxplot.



- a) i) What percentage of the team's away game scores were less than 35? 1
- ii) Find the interquartile range and median for both the Home game and Away game scores. 2
- iii) By using the answers in part ii), compare and contrast the distributions of the team's home and away game scores. 2
- b) Show that  $m = \frac{1}{9}$ , given that  $\int_2^4 \frac{2}{1-x} dx = \ln m$ . 2

**End of Assessment task**