
Student Number

ST PIUS X COLLEGE
CHATSWOOD

HSC 2020 Stage 6
Year 12

Assessment Task #1

20% of School Based Assessment

MATHEMATICS ADVANCED

General Instructions

- Working time – 45 minutes
- Write using black or blue pen
  Black pen is preferred
- Draw diagrams using pencil
- NESA approved calculators may be used
- Marks may be deducted for careless or poorly arranged work
- Show all relevant mathematical reasoning and/or calculations
- Write your Student Number at the top of this cover page

Total Marks – 40

Section I – Multiple Choice 5 marks

- Attempt Questions 1 – 5
- Enter responses on the multiple choice answer sheet
- Allow 5 minutes for this section

Section II – 35 marks

- Attempt Questions 6 – 8
- Answer in the writing spaces provided
- Show all necessary working
- Allow 40 minutes for this section

Section I – Multiple Choice 1 mark per question **5 Marks**

Use the multiple choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

A ⬭ B ● C ⬭ D ⬭

If you think that you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

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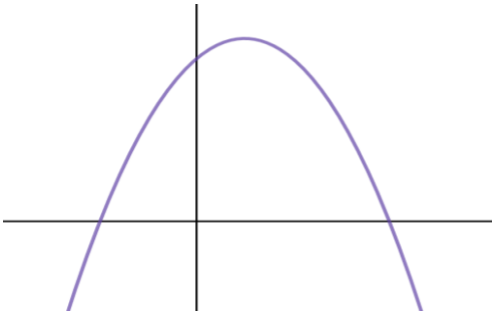
1. The first three terms of an arithmetic series are 3, 7 and 11. What is the 17^{th} term?

(A) 67
(B) 71
(C) 595
(D) 666

2. The diagram below shows a parabola.



Which of the following could be the equation for this graph?

(A) $y = (2 + x)(1 - x)$ (B) $y = (2 + x)(1 + x)$

(C) $y = (1 + x)(2 - x)$ (D) $y = (1 - x)(2 - x)$

3. A student is asked to draw a graph of the function $y = \dfrac{x-5}{3x+2}$.

Their graph of the function needs to include which of the following asymptotes?

(A) $x = 5$ and $y = -\frac{2}{3}$

(B) $x = -\frac{2}{3}$ and $y = 0$

(C) $x = 5$ and $y = \frac{1}{3}$

(D) $x = -\frac{2}{3}$ and $y = \frac{1}{3}$

4. If $f(x) = 4 - x^2$ and $g(x) = 2x - 1$, what would be an expression for $f \circ g(x)$?

(A) $4x^2 + 1$

(B) $3 - 4x^2$

(C) $3 + 4x - 4x^2$

(D) $5 + 4x - 4x^2$

5. Consider the geometric series $a^2 + a + 1 + \frac{1}{a} + \frac{1}{a^2} + \cdots$ for $a > 1$.

Which of the following is the correct expression for the limiting sum of the series?

(A) $\dfrac{a^2}{a-1}$

(B) $\dfrac{a^3}{a-1}$

(C) $\dfrac{a^2}{1-a^2}$

(D) $\dfrac{a^3}{1-a}$

End of Section I

Section II **35 Marks**

Attempt Questions 6 to 8.
Allow about 50 minutes for this section.

In Questions 6 to 8 your responses should include relevant mathematical reasoning and/or calculations.

Question 6 (12 marks)

Write your solutions in the spaces provided **Marks**

(a) Consider the arithmetic series $40 + 46 + 52 + \cdots + 256$

(i) How many terms are in the series? **2**

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(ii) Find the sum of the series. **2**

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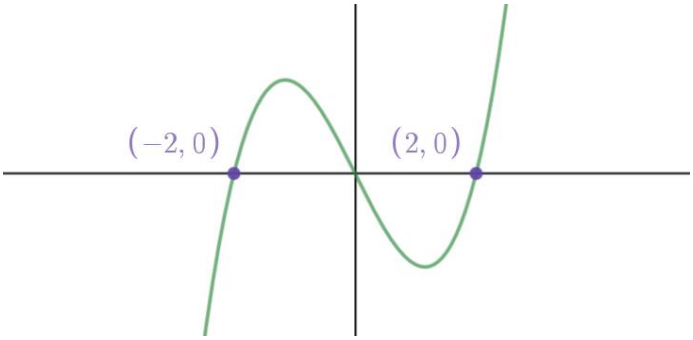
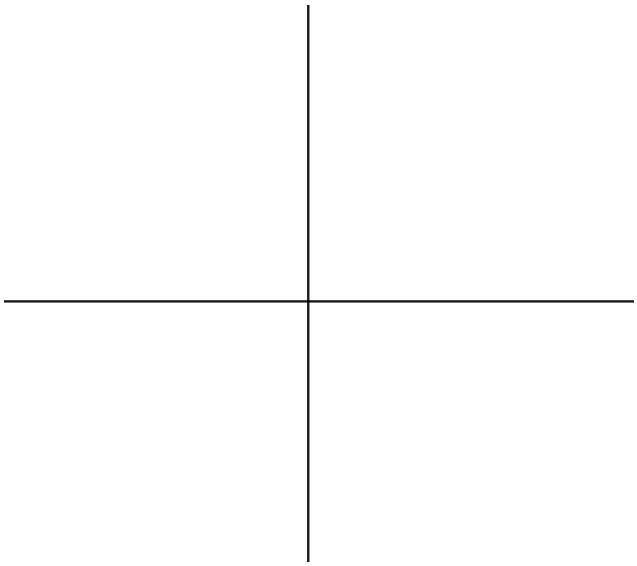
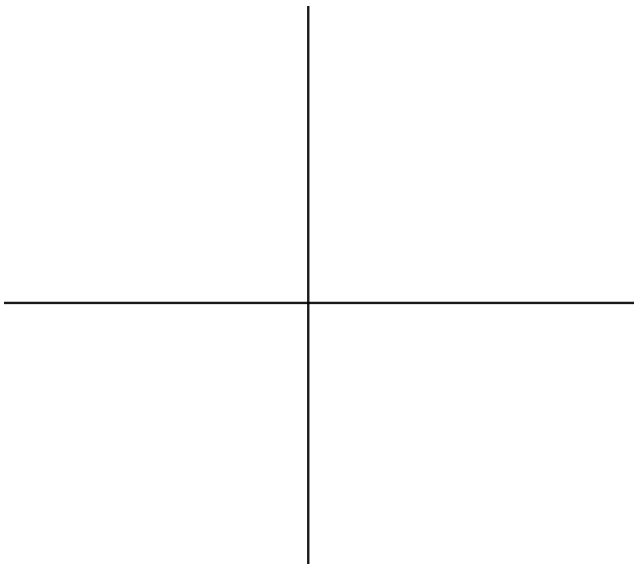
(b) The diagram below shows the graph of a cubic function $y = f(x)$.



(i) In the space below, draw the graph of $y = -f(x)$ **1**



(ii) In the space below, draw the graph of $y = f(x + 3)$ **2**



(c) Solve the inequation $|4x - 5| \leq 25$ **2**

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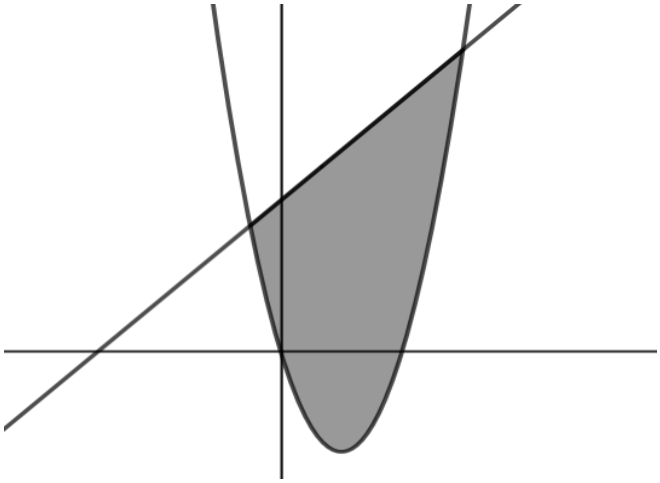
(d) The diagram below shows the line $y = x + 6$ crossing the parabola $y = x^2 - 4x$ at two different points



Find the coordinates of the two points of intersection. **3**

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Question 7 (12 marks)

Write your solutions in the spaces provided **Marks**

(a) Braiden and Kiefer are employed by an engineering company.

Braiden accepts employment with an initial annual salary of $50 000. In each of the following years his annual salary is increased by $2500.

Kiefer accepts employment with an initial annual salary of $50 000. In each of the following years his annual salary is increased by 4%.

(i) What is Braiden's annual salary in his thirteenth year? **2**

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(ii) What is Kiefer's annual salary in his thirteenth year? **2**

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(iii) By what amount does the total amount paid to Kiefer in his first twenty years exceed that paid to Braiden in his first 20 years? **3**

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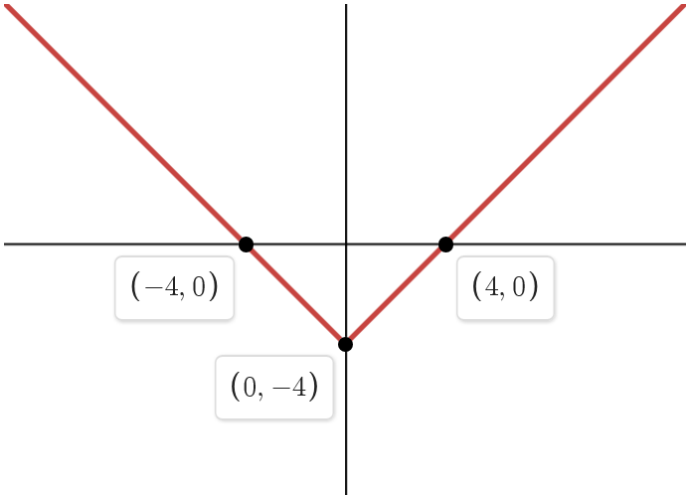
(b) The diagram below shows the graph of $f(x) = |x| - 4$.



(i) If the graph of $y = f(x)$ was translated 4 units to the right and then 3 units up, what would be the equation of the new graph? **1**

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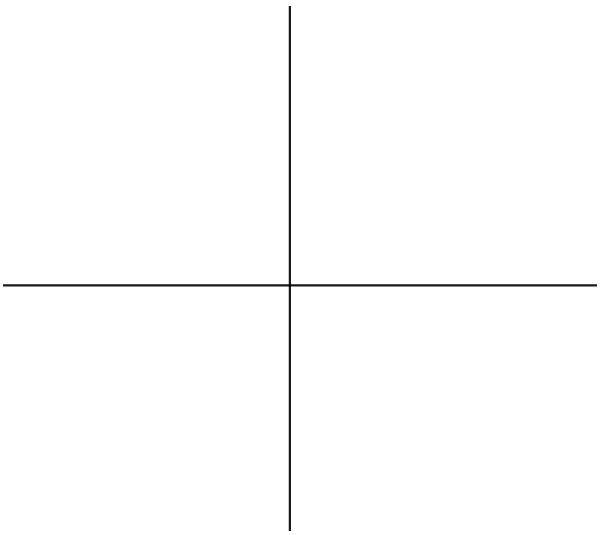
(ii) Draw this new translated graph on the coordinate axes provided below: **1**



(c) A rechargeable battery provides power for 100 hours when first purchased fully charged. After its first recharge, the battery only provides power for a further 80 hours. After its second recharge, the battery only provides power for a further 64 hours. Each subsequent recharge results in the battery providing 80% of its previous power output.

(i) How much additional time would you expect the battery to provide after its 10th recharge? Give your answer correct to the nearest minute. **2**

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(ii) How many total hours would you expect the battery to provide? **1**

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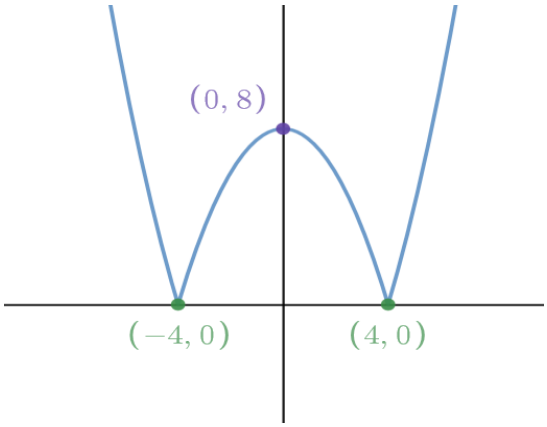
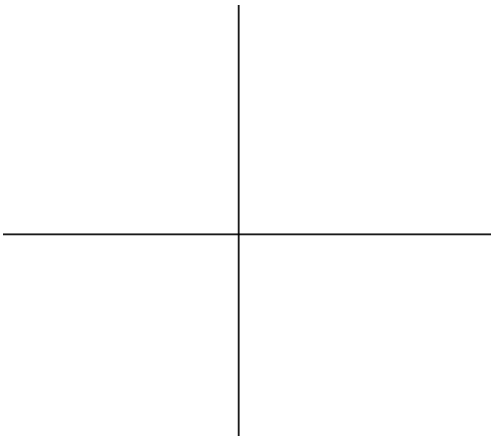
Question 8 (11 marks)

Write your solutions in the spaces provided **Marks**

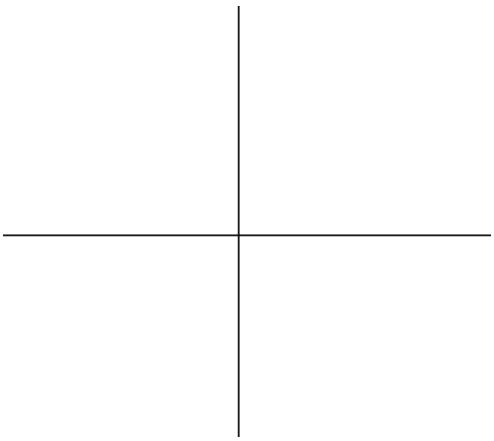
(a) The diagram below shows a function $y = f(x)$ with x intercepts at $(-4, 0)$ and $(4,0)$ and a y intercept at $(0,8)$.



(i) On the coordinate axes provided below, draw a new graph after dilating the function $y = f(x)$ horizontally by a factor of 2. **2**



(ii) In the space provided below, take your dilation from part (i) and draw the graph after a further vertical dilation of 0.75. **2**



(b) Consider the series $101+92+83+74+\cdots$

(i) Find a simplified expression for term number n, or T_n of the series. **2**

(ii) Find the first negative term of the series. **2**

(iii) How terms need to be added together to generate a sum of -725 ? **3**

End of Task

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

Student Number

Mathematics Extension 2 – Multiple Choice Questions Answer Sheet

Attempt all questions:

Question	**1**	A ⬭	B ⬭	C ⬭	D ⬭
	2	A ⬭	B ⬭	C ⬭	D ⬭
	3	A ⬭	B ⬭	C ⬭	D ⬭
	4	A ⬭	B ⬭	C ⬭	D ⬭
	5	A ⬭	B ⬭	C ⬭	D ⬭