Ms Davis **Mr Feng**
Mrs Greenberg **Mrs Kerr**
Mrs Kydd **Mrs Squires**

Pymble Ladies' College

YEAR 11
ASSESSMENT TASK 1
2022

Mathematics Extension 1
Question Booklet

Time allowed: 60 minutes
Total marks: 35
Section I 5 marks
Section II 30 marks

Instructions

- Working time – 60 minutes.
- NESA approved calculators may be used.
- Reference sheets are provided.

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SECTION I

Multiple Choice (5 marks)

Answer using the Multiple Choice Answer Sheet.

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1 What are the values of a and b if $\dfrac{5+\sqrt{3}}{2-\sqrt{3}} = a + b\sqrt{3}$, where a and b are rational?

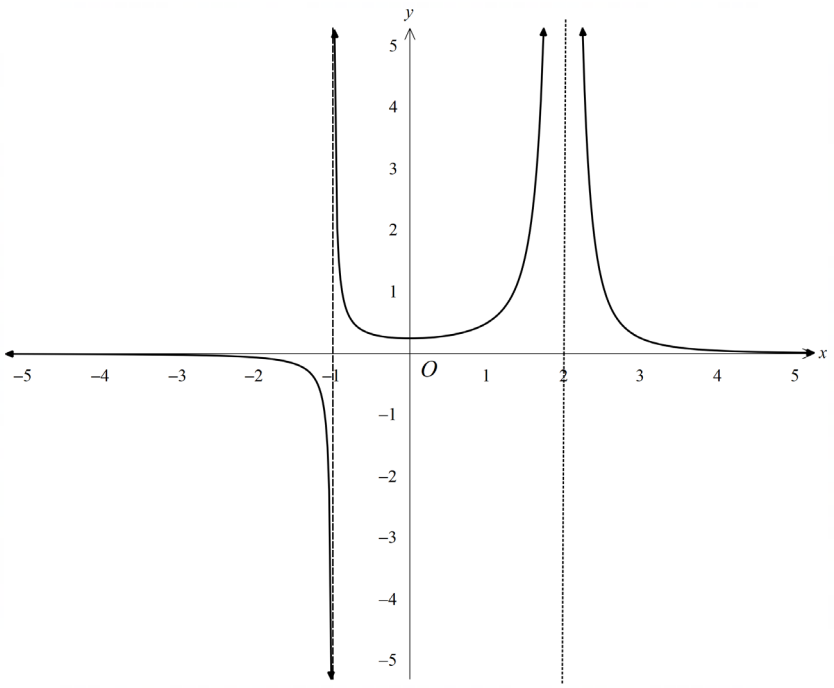
(A) $a = 5,\ b = 2$

(B) $a = 13,\ b = 7$

(C) $a = 7,\ b = -3$

(D) $a = -5,\ b = -2$

2 The graph of $y = \dfrac{1}{f(x)}$ are provided below. Which of the following can be a possible function of $y = f(x)$?



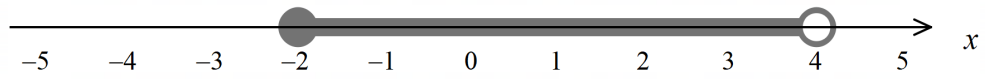
(A) $f(x) = (x+1)(x-2)$

(B) $f(x) = (x+1)^2(x-2)$

(C) $f(x) = (x+1)(x-2)^2$

(D) $f(x) = (1-x)(x+2)^2$

3 Which of the following represents the domain given on the number line below?



(A) $x \in (4, -2]$

(B) $x \in [-2, 4)$

(C) $x \in (4, -2)$

(D) $x \in [-2, 4]$

4 What is the domain of the function $y = f(g(x))$ where $f(x) = \frac{1}{x^2}$ and $g(x) = \sqrt{x^2 - 9}$?

(A) All real values of x but $x \neq \pm 3$

(B) $-3 \leq x \leq 3$

(C) $-3 < x < 3$

(D) $x > 3$ or $x < -3$

5 A circle with equation $x^2 - 6x + y^2 + 8y + k = 0$ meets the coordinate axes at exactly three points. What is the value of k?

(A) 9

(B) 16

(C) 3

(D) 4

SECTION II
30 Marks

Attempt all questions
Answer these questions in the Answer Book provided

Your responses should include relevant mathematical reasoning and/or calculations.
Extra writing space will be provided at the end of the Answer Booklet.

Question 6 (5 marks) **Marks**

Simplify the following expressions:

(a) $\left(2\sqrt{3}-5\right)^2$ **1**

(b) $\dfrac{2}{x^2-1}-\dfrac{1}{x-x^2}$ **2**

(c) $\dfrac{x^{-1}y-xy^{-1}}{x+y}$ **2**

Question 7 (4 marks)

(a) Write down the equation of a straight line with gradient m and y-intercept 3. **1**

(b) Find the values of m such that the line in part (a) intersects the parabola $y=x^2-5x+12$ at two distinct points. **3**

Question 8 (4 marks)

Solve the following:

(a) $9^{2x-1}=27^{x+4}$ **1**

(b) $2x-\sqrt{7-9x}=1$ **3**

Question 9 (3 marks) **Marks**

Solve $\dfrac{x}{x-4} \leq 5$ **3**

Question 10 (4 marks)

(a) Sketch the graph of $y = |x+2|$. **1**

The graph is provided in your Answer Booklet.

(b) Hence, or otherwise, solve $|x+2| \geq x^2$. **3**

Question 11 (4 marks)

The graph of $f(x)$ is provided.

The graph is provided in your Answer Booklet.

(a) Sketch the graph of $y = \dfrac{1}{f(x)}$, indicating all essential features. **2**

(b) Sketch the graph of $y = \sqrt{f(x)}$, indicating all essential features. **2**

Task continues on next page

Question 12 (4 marks) **Marks**

Consider the function $f(x) = x^2 - |4x| - 5$.

(a) Determine whether the function is odd, even or neither. **1**

(b) Sketch the graph of $y = f(x)$, show all essential features. **2**

(c) State the range of $y = f(x)$. **1**

Question 13 (2 marks)

It is given that the different of two squares factorisation can be generalised for higher power to: **2**

$$a^n - b^n = (a-b)\left(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \ldots + ab^{n-2} + b^{n-1}\right)$$

Applying this result, or otherwise, determine whether $3^{2022} - 2^{2022}$ is a prime number.

END OF ASSESSMENT TASK

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