



**Year 11 Mathematics Advanced
Assessment Task 1
Term 2 Week 2, 2023**

Setter: VUL

Name: _____

Teacher: _____

- Answer Questions in the space provided.
- Answer multiple choice questions on the question paper by circling the correct alternative.
- Show all relevant mathematical reasoning and/or calculations.
- Use blue or black PEN only.
- NESA approved calculators are permitted in this task.
- Your own Formula Sheet can be used with this task.
- Marks may be deducted for insufficient or illegible work.
- Extra writing space is provided at the back of this booklet.
If you use this space, clearly indicate which question you are answering.
- Total possible marks: **32**
- Time allowed: **45 minutes plus 2 minutes Reading Time**

Thursday , 4th May 2023

Q1	Q2	Q3	Q4	Q5	Q6	Q7	TOTAL
/6	/6	/4	/4	/4	/4	/4	/32

Question 1 (6 marks)**Marks**

(a) Circle your correct alternative.

1Which inequality gives the domain of $y = \sqrt{3-2x}$?

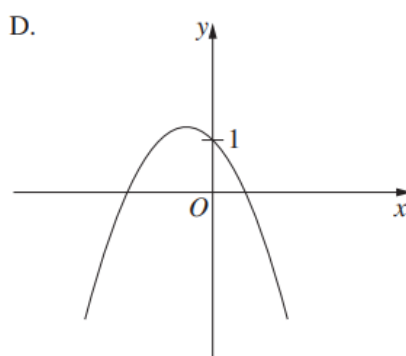
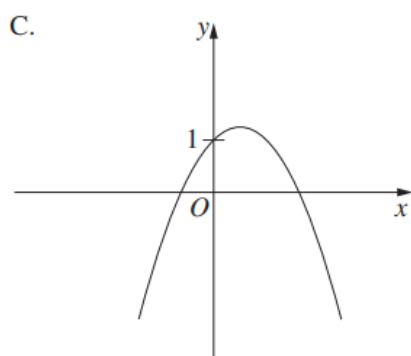
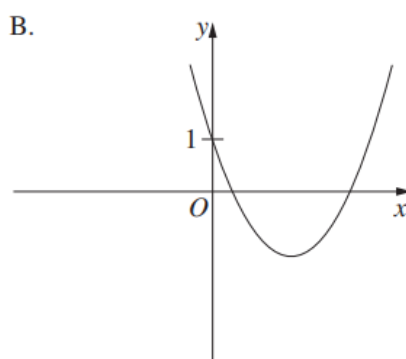
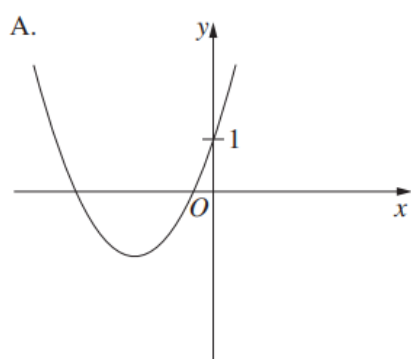
A. $x < \frac{3}{2}$

B. $x > \frac{3}{2}$

C. $x \leq \frac{3}{2}$

D. $x \geq \frac{3}{2}$

(b) Circle your correct alternative.

1Which of the following could represent the graph of $y = -x^2 + bx + 1$, where $b > 0$?

Question 1 Continued

(c) Factorise fully $x^4 - 3x^2 - 4$.

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(d) Fully simplify $\frac{x-y}{y^2+xy-2x^2}$.

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End of Question 1

Question 2 (6 marks)**Marks**

- (a) Circle your correct alternative.

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The function $f(x) = x^3$ is transformed to $g(x) = (x - 2)^3 + 5$ by a horizontal translation of 2 units followed by a vertical translation of 5 units.

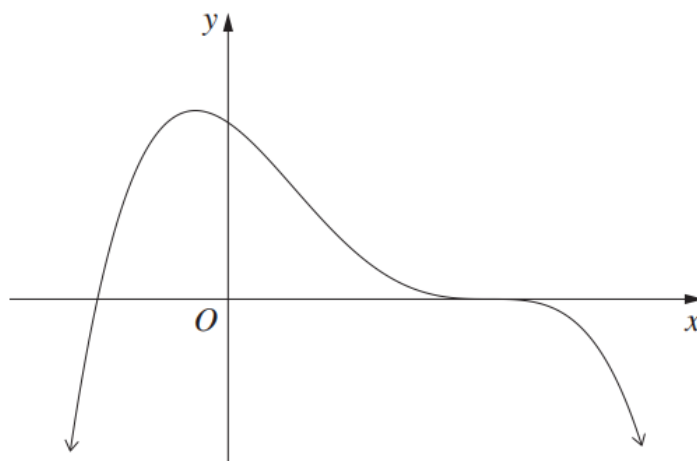
Which row of the table shows the directions of the translations?

	<i>Horizontal translation of 2 units</i>	<i>Vertical translation of 5 units</i>
A.	Left	Up
B.	Right	Up
C.	Left	Down
D.	Right	Down

- (b) Circle your correct alternative.

1

The graph of $y = f(x)$ is shown.



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

- A. $y = (1 - x)(2 + x)^3$
B. $y = (x + 1)(x - 2)^3$
C. $y = (x + 1)(2 - x)^3$
D. $y = (x - 1)(2 + x)^3$

Question 2 Continued

- (c) Find the exact solutions to $\frac{5x}{2} = 2 + \frac{1}{x}$.

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- (d) Form a pair of simultaneous equations to solve this problem:

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“Find two numbers such that if 18 is added to the first number it becomes twice the second number, and if 6 is added to the second number it becomes three times the first number”.

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End of Question 2

Question 3 (4 marks)**Marks**

- (a) Find the value of x if $\sqrt{80} - \sqrt{20} = \sqrt{x}$.

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- (b) Find a and b if $\frac{8}{3-\sqrt{5}}$ can be written in the form $a + b\sqrt{5}$.

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- (c) Explain why $0.\dot{3}$ is a rational number.

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End of Question 3

Question 4 (4 marks)**Marks**

- (a) State the range of $y = -\sqrt{9 - x^2}$.

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- (b) Sketch a possible “one-to-many” relation in the space below.

1

- (c) Sketch the graph of $y = \frac{1}{x+1} + 1$ in the space below.

2**End of Question 4**

Question 5 (4 marks)

- (a) If $f(x) = \sqrt{x}$ sketch the graph of $y = f(x+1)$ show intercepts with the coordinate axes.

1

- (b) Sketch the graph of $x^2 - 10x + y^2 + 8y + 32 = 0$ in the space below.

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End of Question 5

Question 6 (4 marks)

- (a) Show that the function $y = \frac{4x}{x^2 + 4}$ has point symmetry.

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- (b) Find the equation of the line that makes an angle of 120° with the positive x -axis with an x -intercept of 3.

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End of Question 6

Question 7 (4 marks)

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- (a) If $g(x) = x$ simplify $\frac{g(x+h) - g(x)}{h}$.

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- (b) If four distinct positive integers k, l, m and n satisfy the equation

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$(7-k)(7-l)(7-m)(7-n) = 4$, find the value of $k+l+m+n$.

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End of Assessment Task

Extra writing space

If you are using this space indicate clearly which question(s) you are answering & write ‘see extra writing space’ on the original question space provided for that question.

[illegible]



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Assessment Task 1
Term 2 Week 2, 2023**

Setter: VUL

Name: SOLUTIONS

Teacher: _____

Thursday, 4th May 2023

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Q1	Q2	Q3	Q4	Q5	Q6	Q7	TOTAL
/6	/6	/4	/4	/4	/4	/4	/32

(a) Circle your correct alternative.

1

Which inequality gives the domain of $y = \sqrt{3-2x}$

A. $x < \frac{3}{2}$

B. $x > \frac{3}{2}$

C. $x \leq \frac{3}{2}$

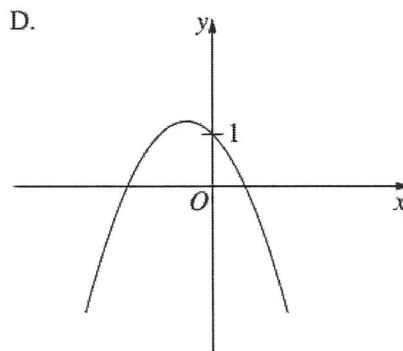
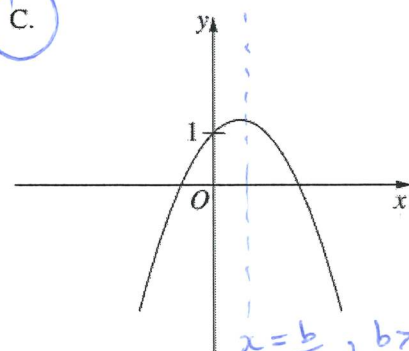
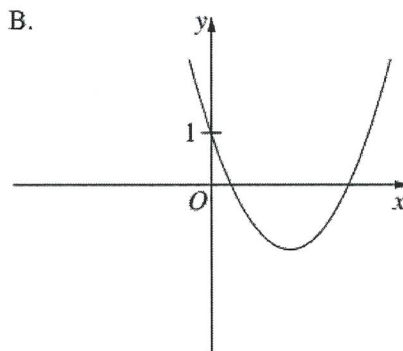
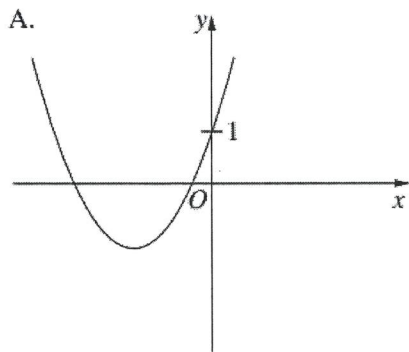
D. $x \geq \frac{3}{2}$

$$\begin{aligned} 3-2x &\geq 0 \\ -2x &\geq -3 \\ x &\leq \frac{3}{2} \end{aligned}$$

(b) Circle your correct alternative.

1

Which of the following could represent the graph of $y = -x^2 + bx + 1$, where $b > 0$?



$$\begin{aligned} x &= -\frac{b}{2a} \\ &= -\frac{b}{-2} \\ &= \frac{b}{2} > 0 \end{aligned}$$

$$x = \frac{b}{2}, b > 0$$

Question 1 Continued

- (c) Factorise fully $x^4 - 3x^2 - 4$.

2

$$(x^2 - 4)(x^2 + 1) \quad \checkmark$$

$$= (x - 2)(x + 2)(x^2 + 1) \quad \checkmark$$

- (d) Fully simplify $\frac{x - y}{y^2 + xy - 2x^2}$.

2

$$= \frac{x - y}{(y - x)(y + 2x)} \quad \checkmark$$

$$= \frac{-1}{y + 2x} \quad \text{or simplified equivalent} \quad \checkmark$$

End of Question 1

Question 2 (6 marks)

Marks

1

- (a) Circle your correct alternative.

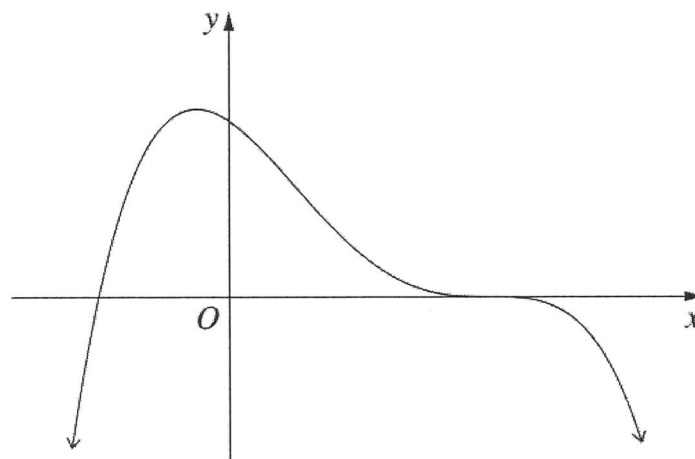
The function $f(x) = x^3$ is transformed to $g(x) = (x - 2)^3 + 5$ by a horizontal translation of 2 units followed by a vertical translation of 5 units.

Which row of the table shows the directions of the translations?

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☒ B.	Right	Up
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D.	Right	Down

- (b) Circle your correct alternative.

The graph of $y = f(x)$ is shown.



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

- A. $y = (1 - x)(2 + x)^3$
 B. $y = (x + 1)(x - 2)^3$
☒ C. $y = (x + 1)(2 - x)^3$
 D. $y = (x - 1)(2 + x)^3$

- single root $x = -1$
 - triple root at $x = 2$.
 - leading co-eff negative.
 $\therefore C$.

Question 2 Continued

- (c) Find the exact solutions to $\frac{5x}{2} = 2 + \frac{1}{x}$

2

$$\begin{aligned}
 5x^2 &= 4x + 2 \\
 5x^2 - 4x - 2 &= 0 \quad \checkmark \\
 x &= \frac{-(-4) \pm \sqrt{(-4)^2 - (4) \times 5 \times -2}}{10} \\
 &= \frac{4 \pm \sqrt{16 + 40}}{10} \\
 &= \frac{4 \pm \sqrt{56}}{10} \quad \checkmark \text{ or equivalent} \\
 &= \frac{4 \pm 2\sqrt{14}}{10} = \frac{2 \pm \sqrt{14}}{5}
 \end{aligned}$$

- (d) Form a pair of simultaneous equations to solve this problem:

2

"Find two numbers such that if 18 is added to the first number it becomes twice the second number, and if 6 is added to the second number it becomes three times the first number".

$$\begin{aligned}
 a + 18 &= 2b \quad \checkmark \quad \text{--- ①} \\
 6 + b &= 3a \quad \checkmark \quad \text{--- ②}
 \end{aligned}$$

from ② $b = 3a - 6$

$$\therefore a + 18 = 2(3a - 6)$$

$$a + 18 = 6a - 12$$

$$5a = 30$$

$$a = 6, \quad b = 12 \quad \checkmark \text{ for both.}$$

End of Question 2

Question 3 (4 marks)

Marks

- (a) Find the value of x if $\sqrt{80} - \sqrt{20} = \sqrt{x}$.

1

$$4\sqrt{5} - 2\sqrt{5} = \sqrt{x}$$

$$2\sqrt{5} = \sqrt{x}$$

$$\sqrt{20} = \sqrt{x}$$

$$x = 20 \quad \checkmark$$

- (b) Find a and b if $\frac{8}{3-\sqrt{5}}$ can be written in the form $a+b\sqrt{5}$.

2

$$\frac{8}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} = a+b\sqrt{5} \quad \checkmark$$

$$\frac{24+8\sqrt{5}}{9-5} = a+b\sqrt{5}$$

$$6+2\sqrt{5} = a+b\sqrt{5}$$

$$\therefore a=6, b=2$$

- (c) Explain why $0.\dot{3}$ is a rational number.

1

$0.\dot{3} = \frac{1}{3}$ which is in form $\frac{p}{q}$, $q \neq 0$, $p, q \in \mathbb{Z}$
with no common factor other than 1.

✓ (must give careful definition
of rational number after
stating $0.\dot{3} = \frac{1}{3}$)

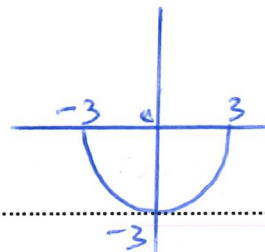
End of Question 3

Question 4 (4 marks)

Marks

- (a) State the range of $y = -\sqrt{9-x^2}$

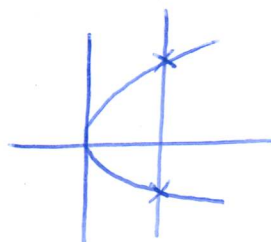
1



$$-3 \leq y \leq 0 \quad \text{or} \quad y \in [-3, 0]$$

- (b) Sketch a possible "one-to-many" relation in the space below.

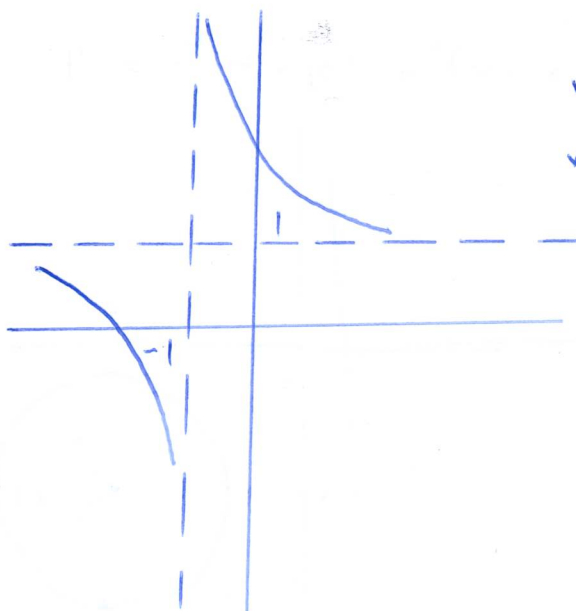
1



distinct
- one x -value to
many y -values.

- (c) Sketch the graph of $y = \frac{1}{x+1} + 1$ in the space below.

2



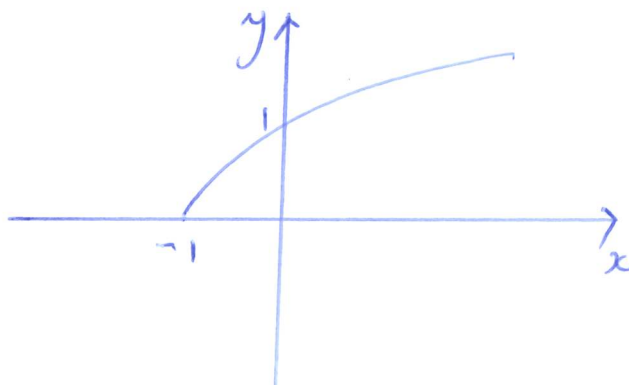
✓ both asymptotes
✓ correct shape and orientation
(intercepts values not required).

End of Question 4

Question 5 (4 marks)

- (a) If $f(x) = \sqrt{x}$ sketch the graph of $y = f(x+1)$ show intercepts with the coordinate axes.

1



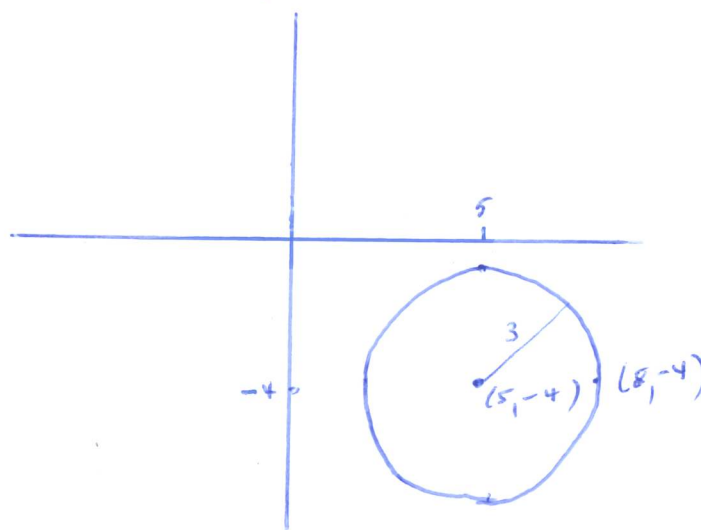
- shape and intercepts.

- (b) Sketch the graph of $x^2 - 10x + y^2 + 8y + 32 = 0$ in the space below.

3

$$x^2 - 10x + 25 + y^2 + 8y + 16 = -32 + 41$$

$$(x-5)^2 + (y+4)^2 = 9$$



- diagram indicating circle centre $(5, -4)$ with a radius of 3.

End of Question 5

Question 6 (4 marks)

- (a) Show that the function $y = \frac{4x}{x^2+4}$ has point symmetry.

2

$$\text{let } f(x) = \frac{4x}{x^2+4}$$

$$f(-x) = \frac{-4x}{(-x)^2+4}$$

$$= -\frac{4x}{x^2+4}$$

$$= -f(x) \quad \text{odd and all odd}$$

functions have point symmetry

- (b) Find the equation of the line that makes an angle of 120° with the positive x-axis with an x-intercept of 3.

2

$$m = \tan 120^\circ$$

$$= -\sqrt{3}$$

$$(3,0) \quad \therefore y - 0 = -\sqrt{3}(x - 3)$$

$$y = -\sqrt{3}x + 3\sqrt{3} \text{ or equivalent}$$

End of Question 6

Question 7 (4 marks)

2

- (a) If $g(x) = x$ simplify $\frac{g(x+h) - g(x)}{h}$.

$$\frac{g(x+h) - g(x)}{h} = \frac{x+h - x}{h} = 1$$

- (b) If four distinct positive integers k, l, m and n satisfy the equation

2

$$(7-k)(7-l)(7-m)(7-n) = 4, \text{ find the value of } k+l+m+n.$$

If k, l, m and n are distinct

then $(7-k), (7-l), (7-m), (7-n)$ are all distinct

being $+1, -1, +2, -2$ (product of four factors

all equal 4).

Adding $7-k + 7-l + 7-m + 7-n = +1 -1 +2 -2$

solving $k+l+m+n = 28$ ✓

End of Assessment Task