

# Supervision Instructions

## Mathematics Methods (Unit 1-2)

### Task #3

18<sup>th</sup> May 2021 – Period 4

Task consists of two papers: **Paper 1** and **Paper 2**. Students will have access to only one paper at a time.

#### **Paper 1:**

- 15 minutes
- Calculator is not allowed

After 15 minutes **Paper 1** is to be collected and **Paper 2** will be given.

#### **Paper 2:**

- 25 minutes
- Calculator is allowed

After 25 minutes **Paper 2** is to be collected.

Check that students put their names.



## 2021 Mathematical Methods (Unit 1-2)

### Task 3

*Paper 1 – Calculator not allowed*

Number of marks: 10

Writing time: 15 minutes

Name:

Marks:

#### Instructions

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

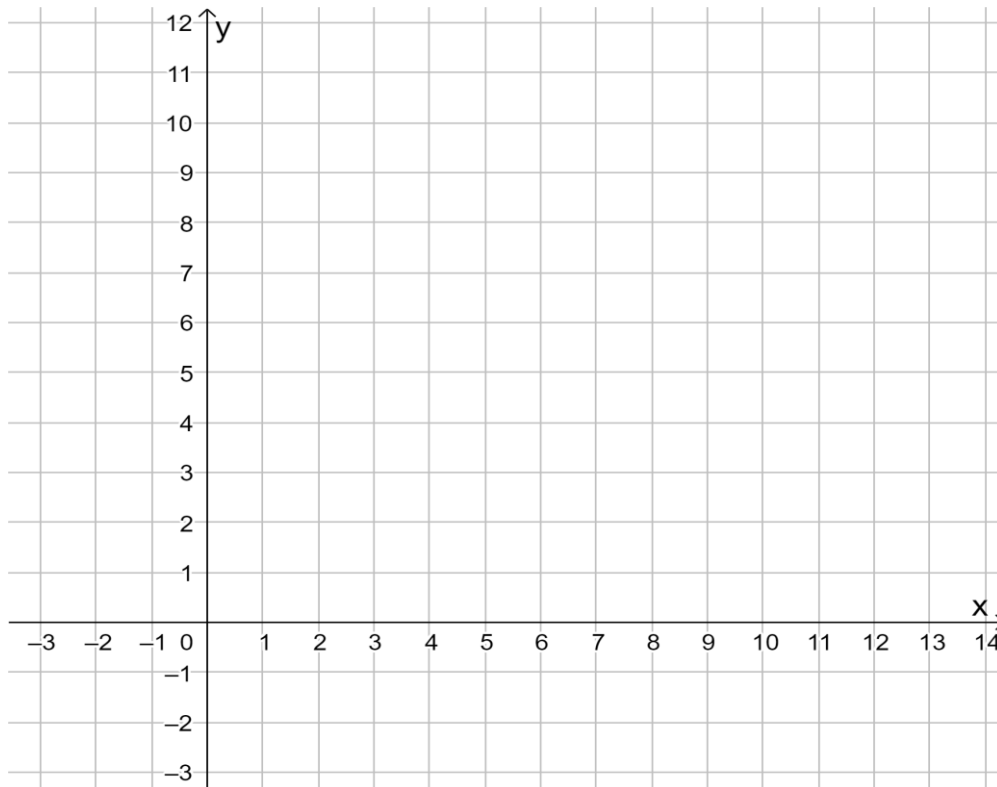
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

#### Question 1

Sketch the graph of  $f : [3, \infty) \rightarrow \mathbb{R}, f(x) = \sqrt{x-3}$  and find the inverse function  $f^{-1}$ .

3 marks

Sketch the graph of  $f^{-1}$  on the same set of axes.



### Question 2

Describe a sequence of transformations applied to the graph of  $y = x^4$  to obtain

3 marks

$$y = \left(\frac{x}{3} + 1\right)^4 + 2.$$

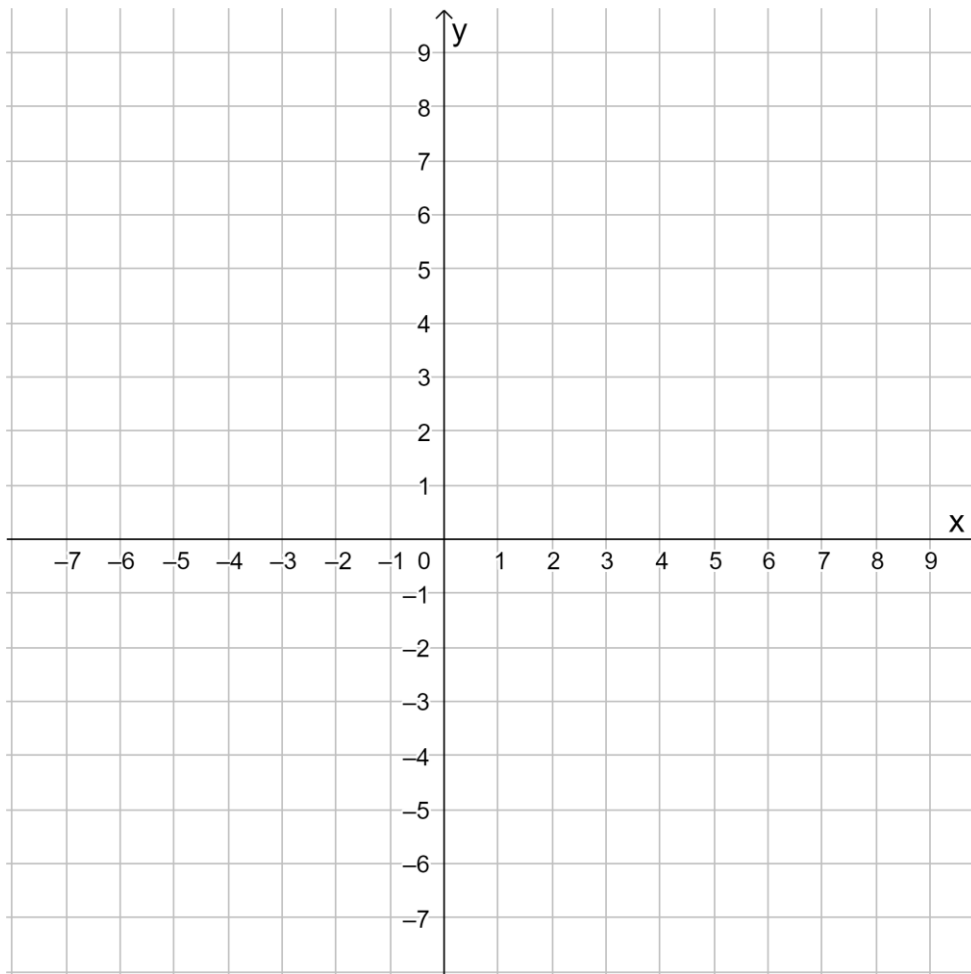
### Question 3

a. Form the rule for the inverse of  $y^2 = x - 2$ .

1 mark

b. Hence sketch the graphs of  $y^2 = x - 2$  and its inverse on the same set of axes.

2 marks



c. State the type of correspondence of each graph.

1 mark



## 2021 Mathematical Methods (Unit 1-2)

### Task 3

Paper 2 – Calculator allowed

Number of marks: 15

Writing time: 25 minutes

Name:

Marks – Section 1:

Section 2:

### SECTION 1

#### Instructions for Section 1

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

#### Question 1

The graph of the function  $f : D \rightarrow R$ ,  $f(x) = \frac{3x-5}{2-x}$ , where  $D$  is the maximal domain has asymptotes:

- A  $x = 2, y = -3$
- B  $x = -2, y = 3$
- C  $x = 3, y = -2$
- D  $x = 2, y = 3$
- E  $x = -2, y = -3$

#### Question 2

Which of the following is correct for the graph of  $y = \sqrt[3]{8x+1}$ ?

- A The endpoint of the domain is  $\left(-\frac{1}{8}, 0\right)$ .
- B The endpoint of the domain is  $\left(-\frac{1}{2}, 0\right)$ .
- C There is a point of inflection at  $\left(-\frac{1}{8}, 0\right)$ .
- D There is a point of inflection at  $(0, 1)$ .
- E There is a point of inflection at  $\left(-\frac{1}{2}, 0\right)$ .

### Question 3

The radius measure of the circle  $(2x+1)^2 + (2y+1)^2 = 100$  is:

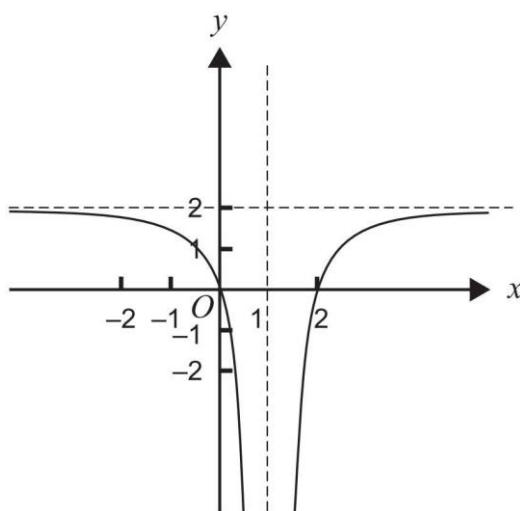
- A 100
- B 10
- C  $7\sqrt{2}$
- D  $5\sqrt{2}$
- E 5

### Question 4

Part of the graph of the function with rule  $y = \frac{a}{(x+b)^2} + c$  is shown below.

The values of  $a$ ,  $b$  and  $c$  respectively are

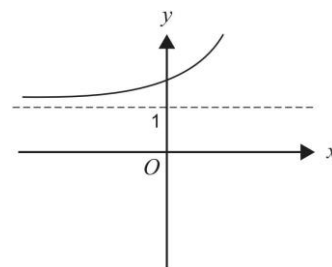
- |   | $a$ | $b$ | $c$ |
|---|-----|-----|-----|
| A | 2   | -1  | 0   |
| B | -2  | -1  | 2   |
| C | 2   | 1   | 1   |
| D | 2   | -2  | 1   |
| E | -2  | 1   | 2   |



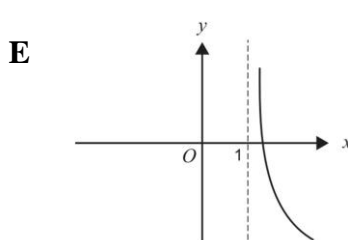
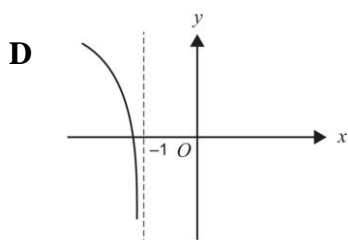
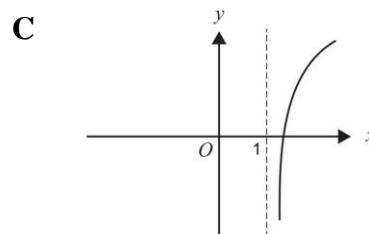
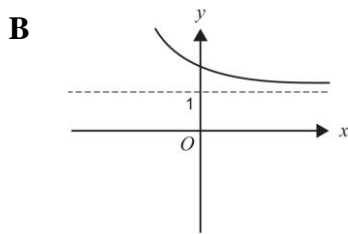
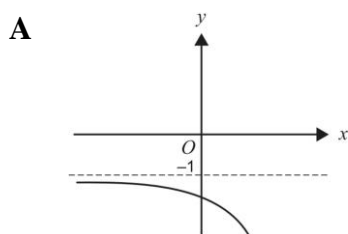
### Question 5

The graph of the function with equation  $y = f(x)$  is shown below.

(A one to-one scale has been used.)



Which one of the following is most likely to be the graph of the inverse function?



## SECTION 2

### Instructions for Section 2

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

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### Question 1

Let  $f : R \setminus \{-2\} \rightarrow R, f(x) = \frac{2x+1}{x+2}$ .

3 marks

Find the rule and domain of  $f^{-1}$ , the inverse function of  $f$ .

### Question 2

A circle has the equation  $x^2 + (y+4)^2 = 16$ .

a. State the centre and radius.

1 mark

b. Give the equation of the top semicircle function.

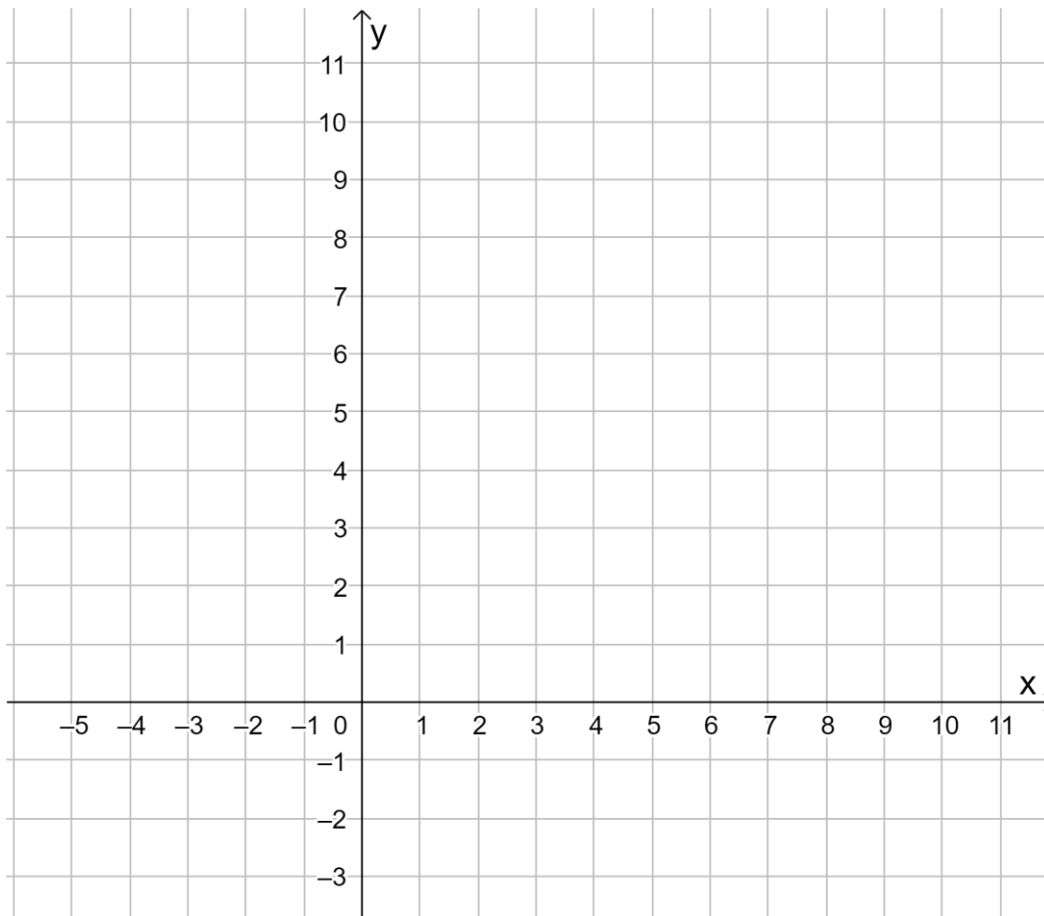
2 marks

### Question 3

a. Sketch the graph of the following function and state its range:

3 marks

$$f(x) = \begin{cases} -x+6, & x \leq 0 \\ x+2, & 0 < x < 3 \\ 2x+1, & x \geq 3 \end{cases}$$



b. Explain whether or not the function is continuous at  $x = 3$ .

1 mark