

Supervision Instructions

Mathematics Methods (Unit 1-2)

Task #3

25th May 2021 – Period 6

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.

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.

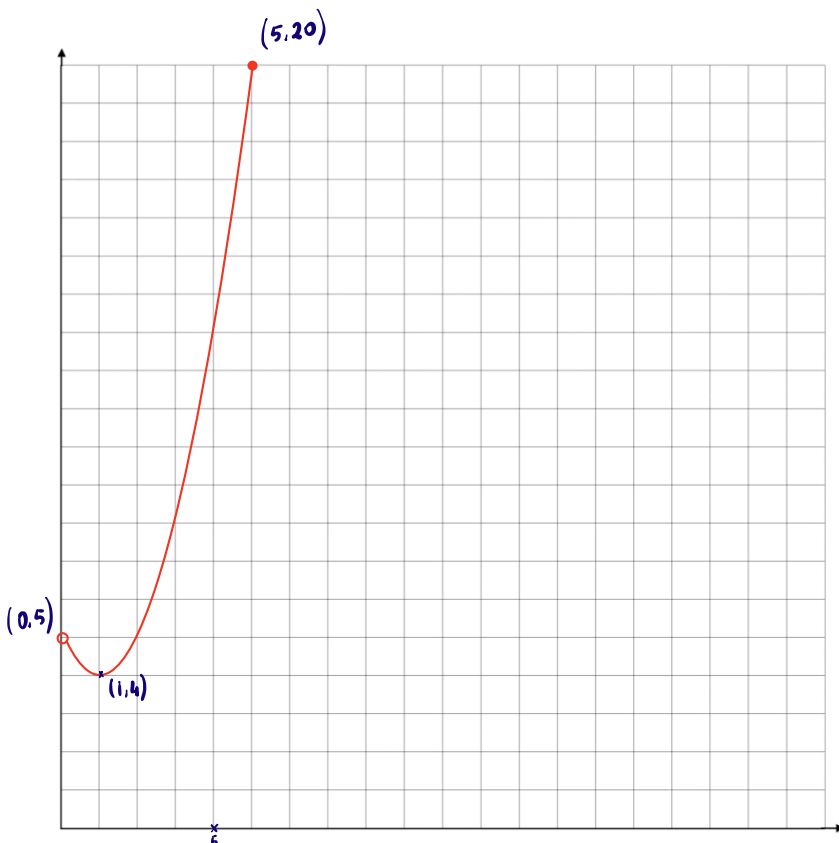
In questions where more than one mark is available, appropriate working **must** be shown.

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

Question 1

- a. Sketch $f : (0, 5] \rightarrow \mathbb{R}, f(x) = x^2 - 2x + 5$, and find its Range

3 marks



$R = [4, 20]$ — 1m

Right end points → 1m

Right graph → 1m

- b. State the type of correspondence of the graph.

1 mark

Many to One

Question 2

Describe a sequence of transformations applied to the graph of $y = x^2$ to obtain

2 marks

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

- reflection in x-axis
- translates 1 unit right
- dF of 2 from y-axis
- translates 3 units down

- OR
- Reflection in x-axis
 - dF of 2 from y-axis
 - translates 1 unit right
 - translates 3 units down

any 2 transformations in right order. → 1m

Question 3

1 mark

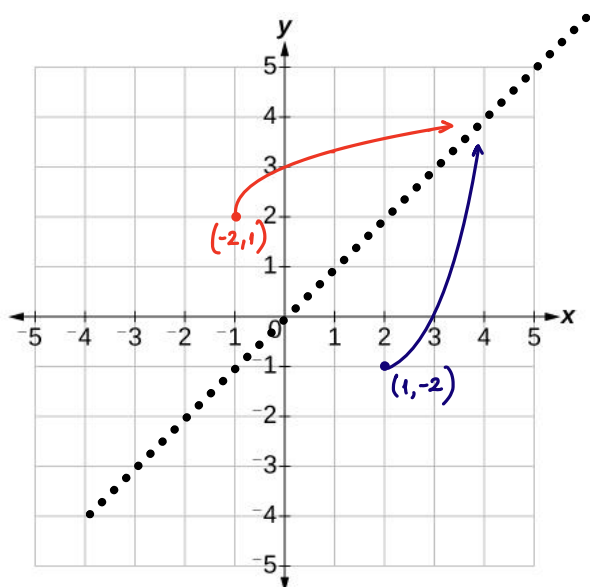
Find a greatest possible domain for $f: [-3, 3] \rightarrow \mathbb{R}, f(x) = \sqrt{9 - x^2}$ so that f^{-1} exists.

$[-3, 0]$ or $[0, 3]$ → 1m (Either one)

Question 4

1+2 marks

- a. Sketch the graph of $f: [1, \infty) \rightarrow \mathbb{R}, f(x) = (x-1)^2 - 2$.
- b. Find the inverse function, and hence sketch it on the same axes



graph of $f(x)$ with restricted dom. → 1m

right graph of inverse → 1m
swapping end points

$$x = (y-1)^2 - 2$$

$$y = \sqrt{x+2} + 1$$

right inverse function → 1m

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.

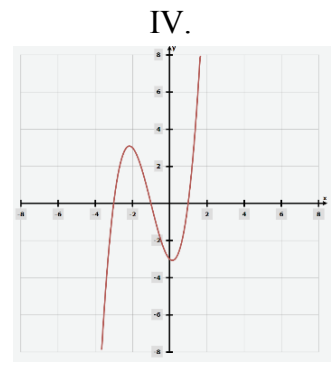
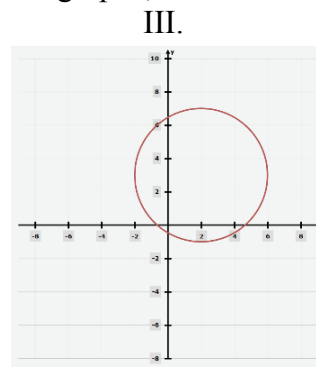
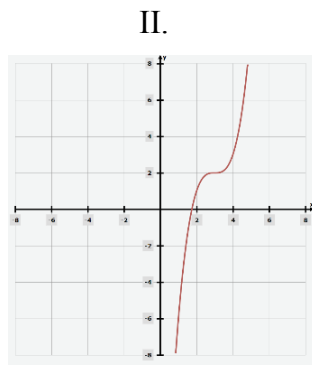
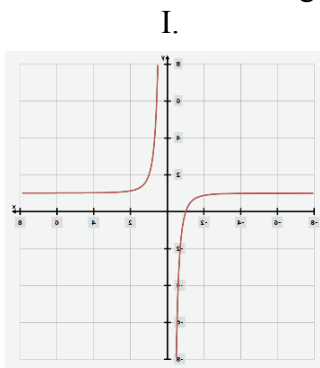
A correct answer scores 1, an incorrect answer scores 0.

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

Which of the following is a **false** statement for the below graphs;



- A III has many to many correspondence
- B Only II and IV are functions**
- C Inverses exist for graphs of I and II.
- D IV has many to one correspondance
- E Domain of II and IV is $(-\infty, \infty)$

Question 2

If $g : (-\infty, 3) \rightarrow \mathbb{R}$, $g(x) = \frac{1}{\sqrt{6-2x}}$, inverse of $g(x)$ is;

- A $g^{-1} : (0, +\infty) \rightarrow \mathbb{R}, g(x)^{-1} = 3 - \frac{1}{2x^2}$
- B $g^{-1} : (-\infty, 3) \rightarrow \mathbb{R}, g(x)^{-1} = 3 - \frac{1}{2x^2}$
- C $g^{-1} : (-\infty, 3) \rightarrow \mathbb{R}, g(x)^{-1} = \frac{1}{(6-2x)^2}$
- D $g^{-1} : \mathbb{R} / \{0\} \rightarrow \mathbb{R}, g(x)^{-1} = 3 - \frac{1}{2x^2}$
- E $g^{-1} : (-\infty, 0) \rightarrow \mathbb{R}, g(x)^{-1} = \sqrt{6 - \frac{x}{2}}$

Question 3

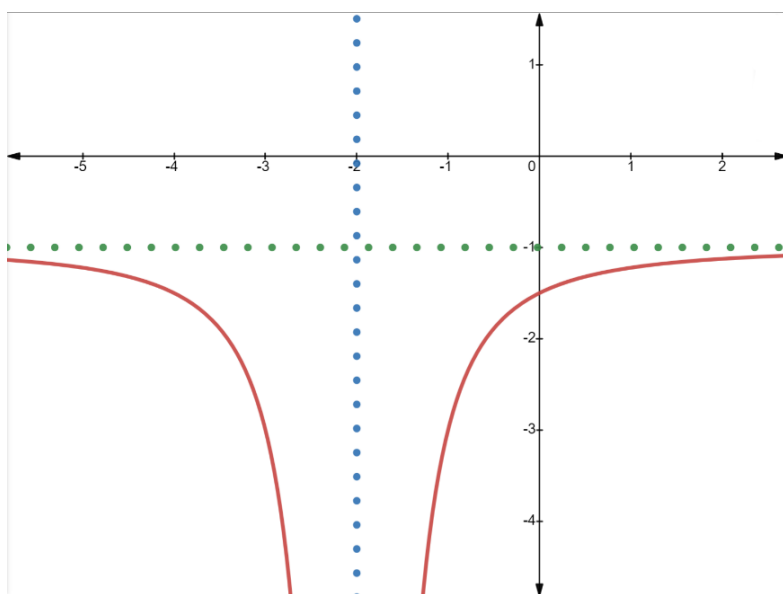
The maximal domain of $f(x) = \frac{x}{\sqrt{9x+45}} + \frac{1}{x}$ is;

- A $[-5, \infty) \setminus \{0\}$
- B $\{-5, 0\}$
- C $\mathbb{R} \setminus \{-5, 0\}$
- D $(-5, \infty) / \{0\}$
- E $[-5, 0]$

Question 4

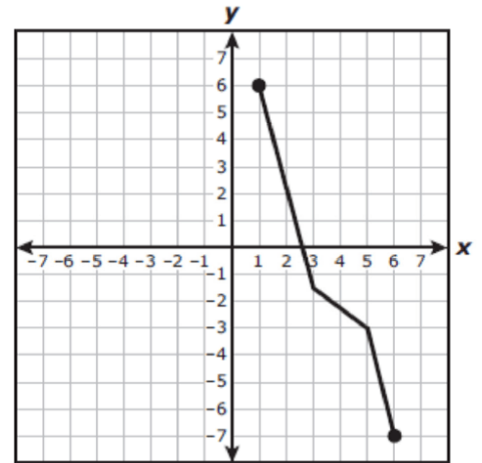
The equation of the graph shown is likely to be:

- A $y = -\frac{2}{(x-2)^2} - 1$
- B $y = 1 - \frac{2}{(x+2)^2}$
- C $y = -\frac{2}{(x+1)^2} - 2$
- D $y = \frac{2}{(x+2)^2} - 1$
- E $y = -\frac{2}{(x+2)^2} - 1$

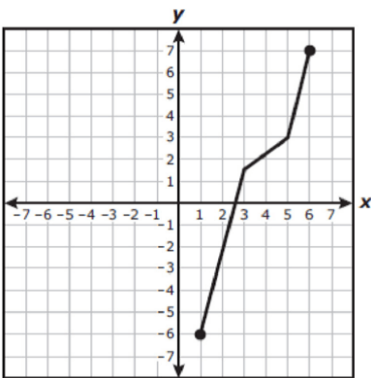


Question 5

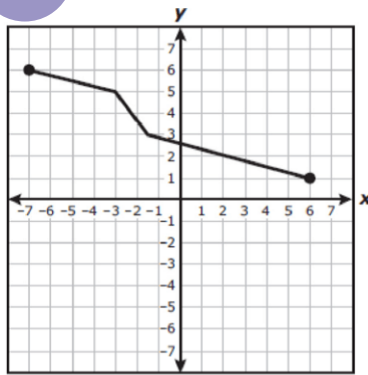
The graph of the function f is shown. Which grid shows the graph of f^{-1} ?



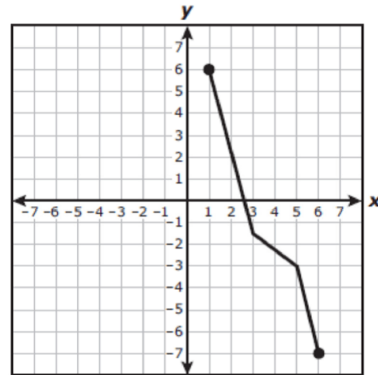
A



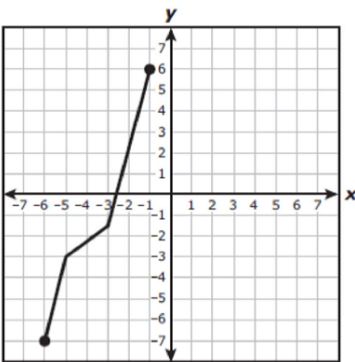
B



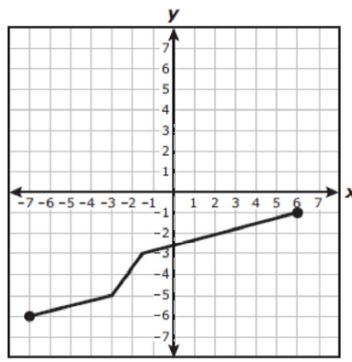
C



D



E



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.

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

Question 1

Let $f : (-\infty, -2) \rightarrow \mathbb{R}, f(x) = \frac{1}{(x+2)^2} - 1$. Write f^{-1} in mapping notation.

2 marks

$$f^{-1} : (-1, \infty) \rightarrow \mathbb{R}, f^{-1}(x) = \sqrt{\frac{1}{x+1}} - 2 \rightarrow 1m$$

↙
1m for right domain

Question 2

State the domain and range in exact form for the semi circle $y = \sqrt{5 - 2x - x^2} + 1$.

3 marks

$$\sqrt{-(x+1)^2 + 6} + 1$$

$C = (-1, 1) \quad r = \sqrt{6} \rightarrow 1m$

dom: $[-1 - \sqrt{6}, -1 + \sqrt{6}] \rightarrow 1m$

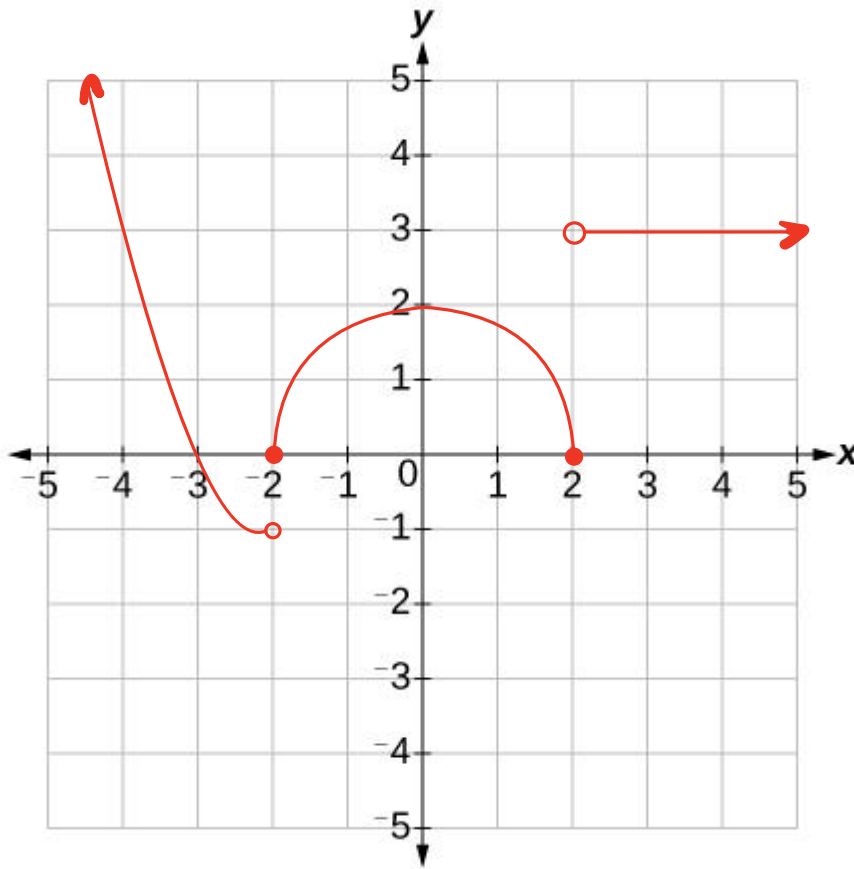
Range: $[1, 1 + \sqrt{6}] \rightarrow 1m$

Question 3

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

4 marks

$$f(x) = \begin{cases} (x+2)^2 - 1, & x < -2 \\ \sqrt{4-x^2}, & -2 \leq x \leq 2 \\ 3, & x > 2 \end{cases}$$



$$R = (-1, \infty) \rightarrow 1m$$

Each graph showing
end points

↓
1m

b. For what values of x is the function discontinuous?

1 mark

at $x = -2$ and $2 \rightarrow 1m$