

Inverse Functions & Transformations

Practice Test (SAC) | CAS

Question and Answer Book

Mathbanks Practice Assessment

- Reading time is **5 minutes**
- Writing time is **85 minutes**

Materials supplied

- Question and Answer Book of 18 pages
- Formula Sheet

Instructions

Students are permitted to bring into the assessment room: one approved CAS technology (calculator or software) and, if desired, one scientific calculator, and one bound reference.

Students are **not** permitted to bring mobile phones and/or any other unauthorised electronic devices into the assessment room.

Contents	pages
7 questions (58 marks)	2–18



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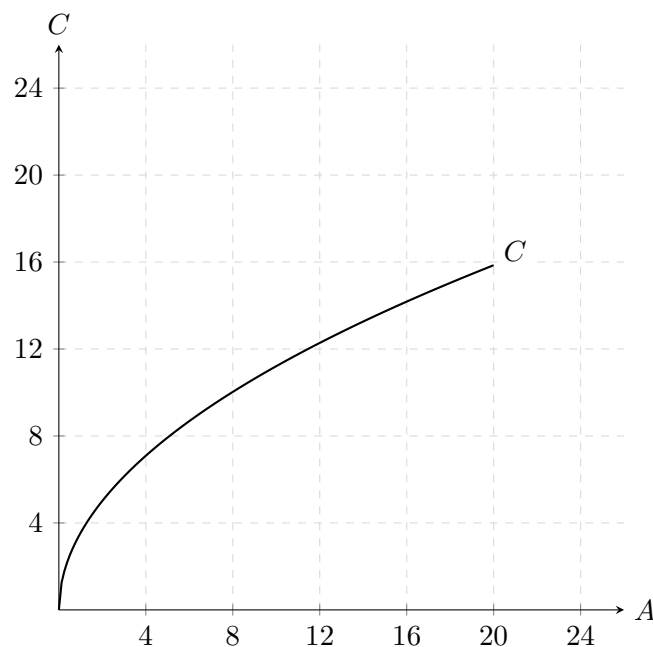
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Instructions

- Answer **all** questions in the spaces provided.
 - Write your responses in English.
 - 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.
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Question 1 (5 marks)

The circumference, C , of a circle can be represented by the function $C(A) = 2\pi\sqrt{\frac{A}{\pi}}$, $A \geq 0$, where A is the area of the circle. The graph of C , for $0 \leq A \leq 20$, is shown below.



- a. Find the value of $C(24)$, correct to two decimal places.

1 mark

b. On the grid above, sketch the graph of the inverse function, C^{-1} .

3 marks

c. In the context of the question, explain the meaning of $C^{-1}(2\pi) = \pi$.

1 mark

Question 2 (9 marks)

Let $f : [3, \infty) \rightarrow \mathbb{R}$, $f(x) = 2\sqrt{x-3} - 1$.

a. Find $f(10)$, correct to two decimal places.

1 mark

b. State the domain and range of f .

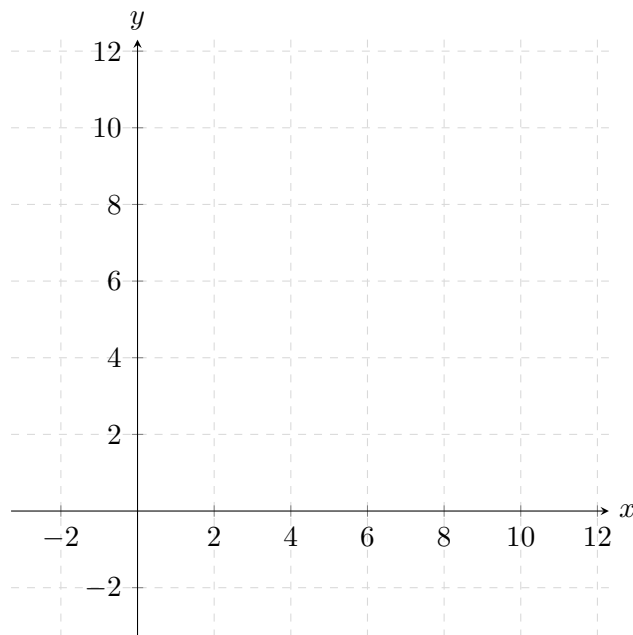
1 mark

c. Find $f^{-1}(x)$, and state its domain.

3 marks

- d. Describe the transformations that map the graph of f onto the graph of $h(x) = 2\sqrt{2x-3} + 1$. 2 marks

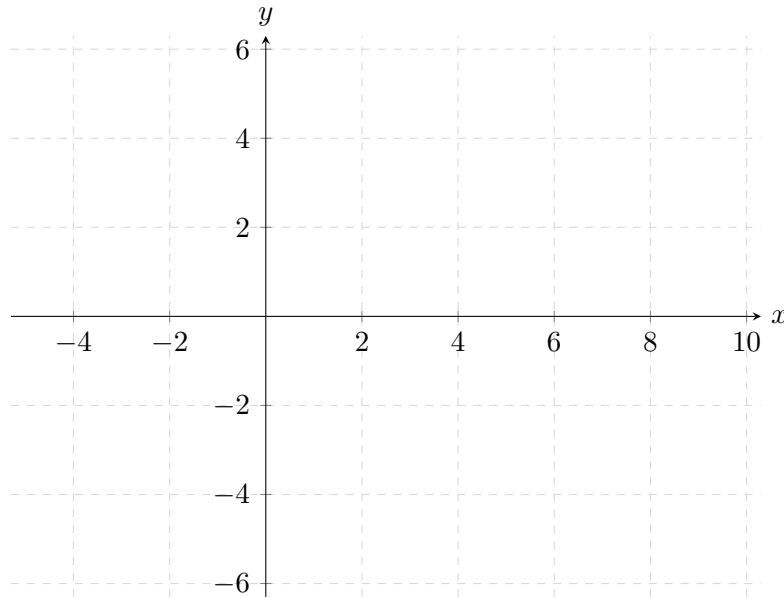
- e. On the axes below, sketch $y = f(x)$, $y = f^{-1}(x)$ and the line $y = x$, labelling the endpoint of each curve. 2 marks



Question 3 (9 marks)

Let $f : \mathbb{R} \setminus \{3\} \rightarrow \mathbb{R}$, $f(x) = \frac{1}{x-3} - 1$.

- a. On the axes below, sketch the graph of $f(x)$, labelling all intercepts and the equations of the asymptotes. 3 marks



- b. Find the equation of the inverse function $f^{-1}(x)$, and state its domain. 3 marks

- c. Describe a sequence of transformations that maps the graph of $f(x)$ onto the graph of $g(x) = \frac{2}{x}$. 3 marks

Question 4 (8 marks)

Let $f : [2, \infty) \rightarrow \mathbb{R}$, $f(x) = (x - 2)^2 + 1$.

a. State the domain and range of f .

1 mark

b. Find $f^{-1}(x)$, and state its domain.

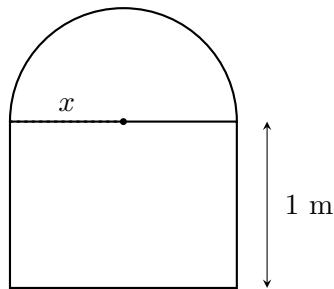
3 marks

- c. Describe the transformations that map the graph of f onto the graph of $h(x) = -(x - 2)^2 + 2$. 2 marks

- d. Find, correct to two decimal places, the coordinates of the point of intersection of $y = f(x)$ and $y = f^{-1}(x)$. 2 marks

Question 5 (7 marks)

Harry is constructing a glass window in an outer wall of his house. The available wall space is $2\text{ m} \times 2\text{ m}$. The window is a rectangle with a semicircle of radius $x\text{ m}$ on top, as shown. Harry fixes the height of the rectangle at 1 m .



- a. Write down a function P (in metres) for the perimeter of the window in terms of the radius, x . 1 mark

- b. Determine the domain and range of P , taking into account the dimensions of the available wall. 2 marks

c. Find an equation for the inverse function $P^{-1}(x)$.

2 marks

The window frame that covers the perimeter can only be 5, 6 or 7 metres long, due to manufacturing restrictions.

d. Determine which perimeter length is the best option for Harry, to maximise the size of the window.

2 marks

Question 6 (11 marks)

The number of pages, P , that an author writes for their book t hours after they start each day can be modelled by the function below. The author never writes for more than 10 hours in a day.

$$P(t) = 40\left(1 - 2^{-t/2}\right)$$

- a. Find $P(5)$, correct to the nearest whole number.

1 mark

- b. Explain what $P(5)$ represents.

1 mark

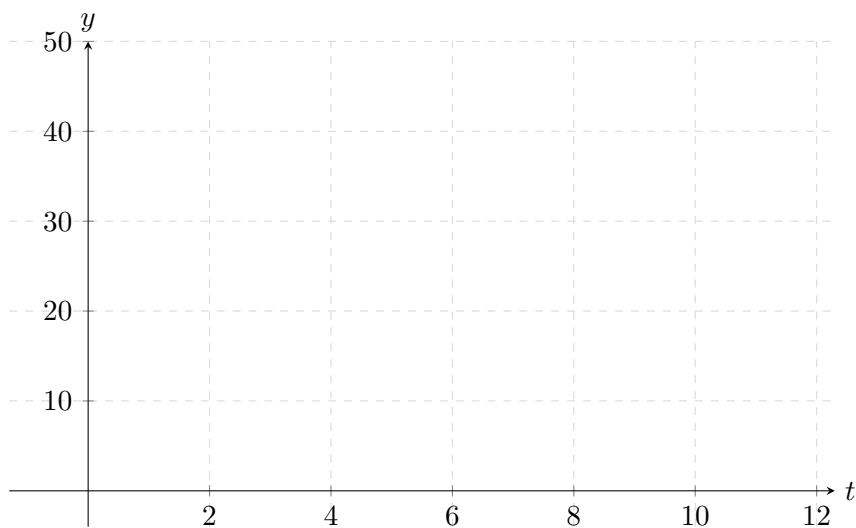
- c. How long will the author take to write 25 pages? Round your answer to two decimal places.

1 mark

- d. Find the domain and range of $y = P(t)$.

2 marks

- e. Sketch the graph of $y = P(t)$, labelling the equation of any asymptote, the axis intercepts and the endpoints. 3 marks



f. Find $P^{-1}(t)$ in the form $P^{-1}(t) = a \log_2 \left(\frac{b-t}{b} \right)$.

3 marks

Question 7 (9 marks)

Let $f(x) = x^4 - x^3 - 5x^2 + 3x + 2$, for $x \in \mathbb{R}$.

a. Solve the inequality $f(x) < 0$.

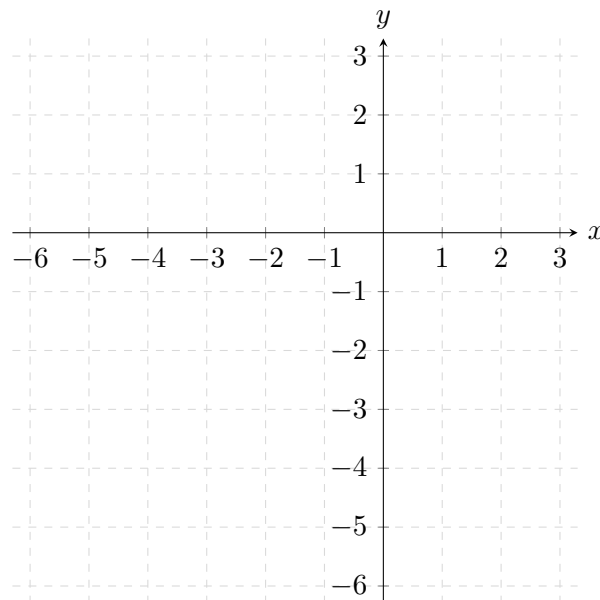
2 marks

b. For the graph of $y = f(x)$, find the coordinates of the local maximum point, correct to **three decimal places**.

2 marks

The domain of f is now restricted to $[a, b]$, where $a, b \in \mathbb{R}$.

- c. Write down the smallest value of $a < 0$ and the largest value of $b > 0$ for which f has an inverse. Give your answers correct to **three decimal places**. 2 marks



Mathematical Methods Units 1 & 2 formulas

Functions and graphs

distance formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
midpoint formula	midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Straight line graphs

general equation	$y = mx + c$
equation through point (x_1, y_1)	$y - y_1 = m(x - x_1)$
gradient	$m = \frac{y_2 - y_1}{x_2 - x_1}$

Mensuration

circumference of a circle	$2\pi r$	area of a circle	πr^2
volume of a sphere	$\frac{4}{3}\pi r^3$	volume of a cylinder	$\pi r^2 h$

Calculus

$\frac{d}{dx}(x^n) = nx^{n-1}$	$\int x^n dx = \frac{1}{n+1}x^{n+1} + c, n \neq -1$
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Probability

$\Pr(A) = 1 - \Pr(A')$	$\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$
$\Pr(A B) = \frac{\Pr(A \cap B)}{\Pr(B)}$	

About Mathbanks

Mathbanks is an online question bank for VCE Mathematics. It contains thousands of original, exam-style questions — each written with a complete worked solution and mark scheme — organised by topic and by difficulty across Mathematical Methods Units 1 & 2 and Units 3 & 4.

About This Test

This practice test features inverse functions and transformations applied in CAS-enabled contexts across VCE Mathematical Methods Units 1 & 2. Students use CAS technology to find and evaluate inverse functions, restrict the domain so that an inverse exists, and sketch a function together with its inverse, reading key features correct to two decimal places. The test develops fluency with transformations of graphs — dilations, reflections and translations — and with stating a transformed function's rule, domain and range. Students construct and analyse function models drawn from measurement and real-world situations, solve equations and inequalities with technology, and interpret their results in context. Topics include inverse relations, restricted domains, composite behaviour, and applications where a function and its inverse are used to model and solve a problem.



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