

Trial Examination 2010

## VCE Mathematical Methods (CAS) Units 3 & 4

Written Examination 1

### Question and Answer Booklet

Reading time: 15 minutes

Writing time: 1 hour

Student's Name: \_\_\_\_\_

Teacher's Name: \_\_\_\_\_

#### Structure of Booklet

Number of questions	Number of questions to be answered	Number of marks
10	10	40

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers.

Students are NOT permitted to bring into the examination room: notes of any kind, blank sheets of paper, white out liquid/tape or a calculator of any type.

#### Materials supplied

Question and answer booklet of 9 pages, with a detachable sheet of miscellaneous formulas in the centrefold.

Working space is provided throughout the booklet.

#### Instructions

Detach the formula sheet from the centre of this booklet during reading time.

Write your **name** and **teacher's name** in the space provided above on this page.

All written responses must be in English.

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

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2010 VCE Mathematical Methods (CAS) Units 3 & 4 Written Examination 1.

**Instructions**

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

A decimal approximation will not be accepted if an **exact** answer is required to a question.

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

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

**Question 1**

Let  $f : [0, 2\pi] \rightarrow R$ , where  $f(x) = \sin^2\left(2x - \frac{\pi}{2}\right) - 1$ .

- a. Find the  $y$ -intercept of the graph of  $y = f(x)$ .

---



---

1 mark

- b. Find the  $x$ -intercepts of the graph of  $y = f(x)$ .

---



---



---



---



---

3 marks



**Question 3**

Let  $f : (-\infty, a) \rightarrow \mathbb{R}$ , where  $f(x) = (x - 2)^2 + 4$ .

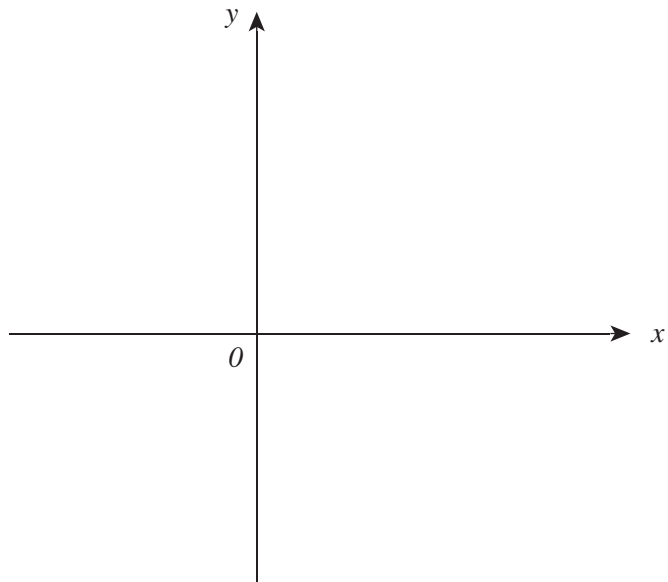
- a. State the largest value of  $a$  such that the graph of  $y = f(x)$  is one-to-one.

\_\_\_\_\_ 1 mark

- b. Find the rule of the inverse function  $f^{-1}$ .

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ 2 marks

- c. Sketch the graph of  $y = f^{-1}(f(x))$  on the axes below.



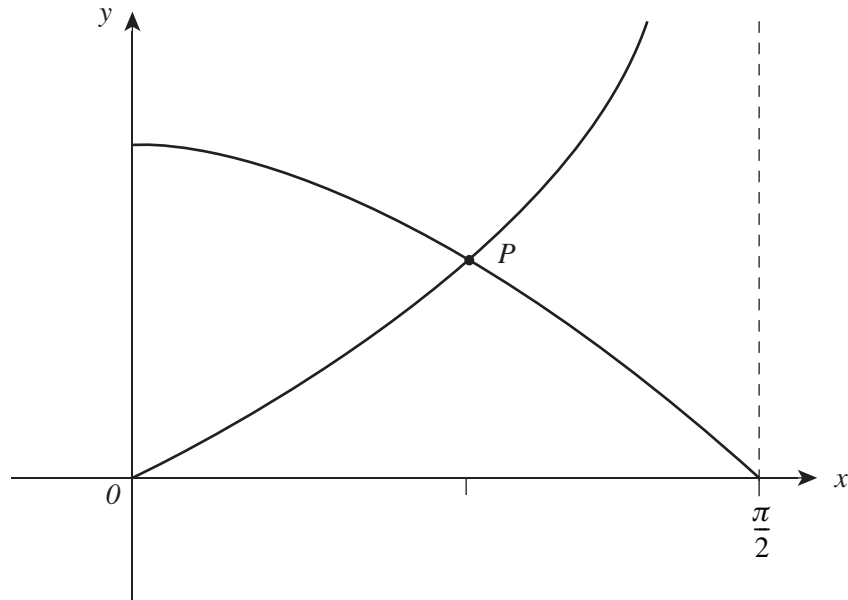
1 mark

**Question 4**

Consider the two functions  $f$  and  $g$  defined by the rules  $f(x) = \tan(x)$  and  $g(x) = \sqrt{2}\cos(x)$ .

- a. On the axes below, the graphs of  $f$  and  $g$  are shown over the domain  $\left[0, \frac{\pi}{2}\right)$ .

Label each graph as  $f$  or  $g$  and write down the coordinates of  $P$ .



2 marks

- b. Differentiate  $\log_e(\cos(x))$  and hence find an antiderivative of  $\tan(x)$ .

---



---



---

2 marks

- c. Find the area enclosed by the  $y$ -axis and the graphs of  $f$  and  $g$ .

---



---



---



---



---



---

3 marks

**Question 5**

Consider the independent events  $A$  and  $B$  where  $\Pr(A|B) = \frac{3}{4}$  and  $\Pr(B) = \Pr(A' \cap B')$ .

Find  $\Pr(B)$ .

---

---

---

---

---

---

---

---

---

---

3 marks

**Question 6**

Solve the equation  $e^x - 4 = 5e^{-x}$  for  $x$ .

---

---

---

---

---

---

---

---

2 marks



**Question 9**

A transformation is described by the equation:

$$TX + B = X' \text{ where } T = \begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix}, B = \begin{bmatrix} -4 \\ 2 \end{bmatrix}, X = \begin{bmatrix} x \\ y \end{bmatrix} \text{ and } X' = \begin{bmatrix} x' \\ y' \end{bmatrix}$$

- a. Find the image of point (2, 3).

---



---



---

1 mark

- b. Find the image of the line with equation  $y = 2x - 4$  under this transformation.

---



---



---



---



---



---



---



---



---

3 marks

- c. Write in words, in the correct order, the transformations described by the equation  $TX + B = X'$ .

---



---



---



---



---

2 marks



**Question 10**

- a. Use the relationship  $f(x + h) \approx f(x) + hf'(x)$  for small positive values of  $h$ , to find the approximate change in the volume of a cuboid with volume  $V \text{ cm}^3$ , given by  $V = 6x^3$ , if  $x$  changes from 3 cm to 3.02 cm.

---

---

---

---

---

---

---

---

2 marks

- b. Explain whether this approximation is either greater or less than the exact change.

---

---

---

---

---

1 mark

**END OF QUESTION AND ANSWER BOOKLET**