Student Name: _____

MATHEMATICAL METHODS (CAS)

Units 3 & 4 – Written examination 1

T_{SSM}
Creating VCE Success

2008 Trial Examination

Reading time: 15 minutes
Writing time: 1 hour

QUESTION AND ANSWER BOOK

Structure of book

Number of questions	Number of questions to be answered	Number of marks
12	12	40
		Total 40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
- No calculator is permitted in this examination.

Materials supplied
- Question and answer book of 10 pages.

Instructions
- Print your name in the space provided on the top of this page.
- All written responses must be in English.

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

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| **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 book are **not** drawn to scale. |

Question 1

a. State the transformations made to the graph of $y = \dfrac{1}{x}$ in order to obtain the graph
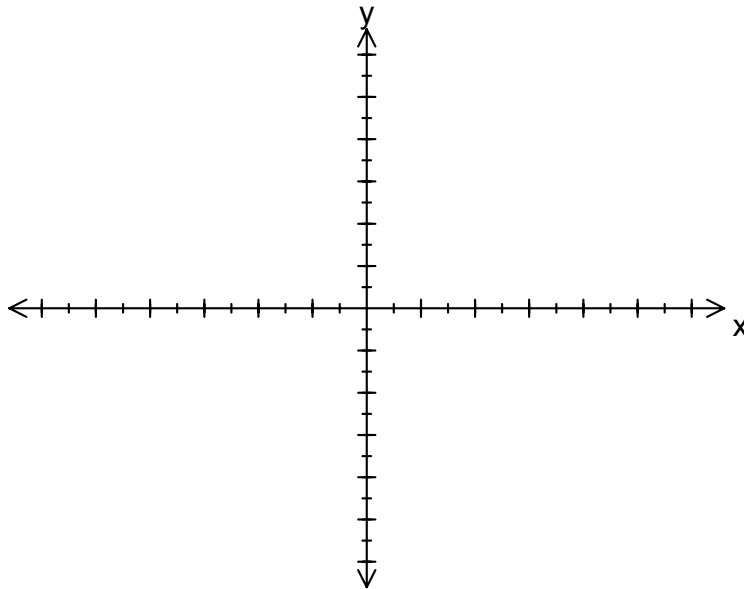
$y = -\dfrac{4}{x-3} - 2$.

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1 mark

b. Hence or otherwise, sketch $y = -\dfrac{4}{x-3} - 2$ and label any asymptote(s) and axial intercept(s).

_____

_____

3 marks

TURN OVER

Question 2

Solve $2^{2x} - 2^{x+3} + 2^4 = 0$.

_____

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3 marks

Question 3

a. If $f(x) = 1 - 2e^{x-1}$, find the inverse function $f^{-1}(x)$.

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3 marks

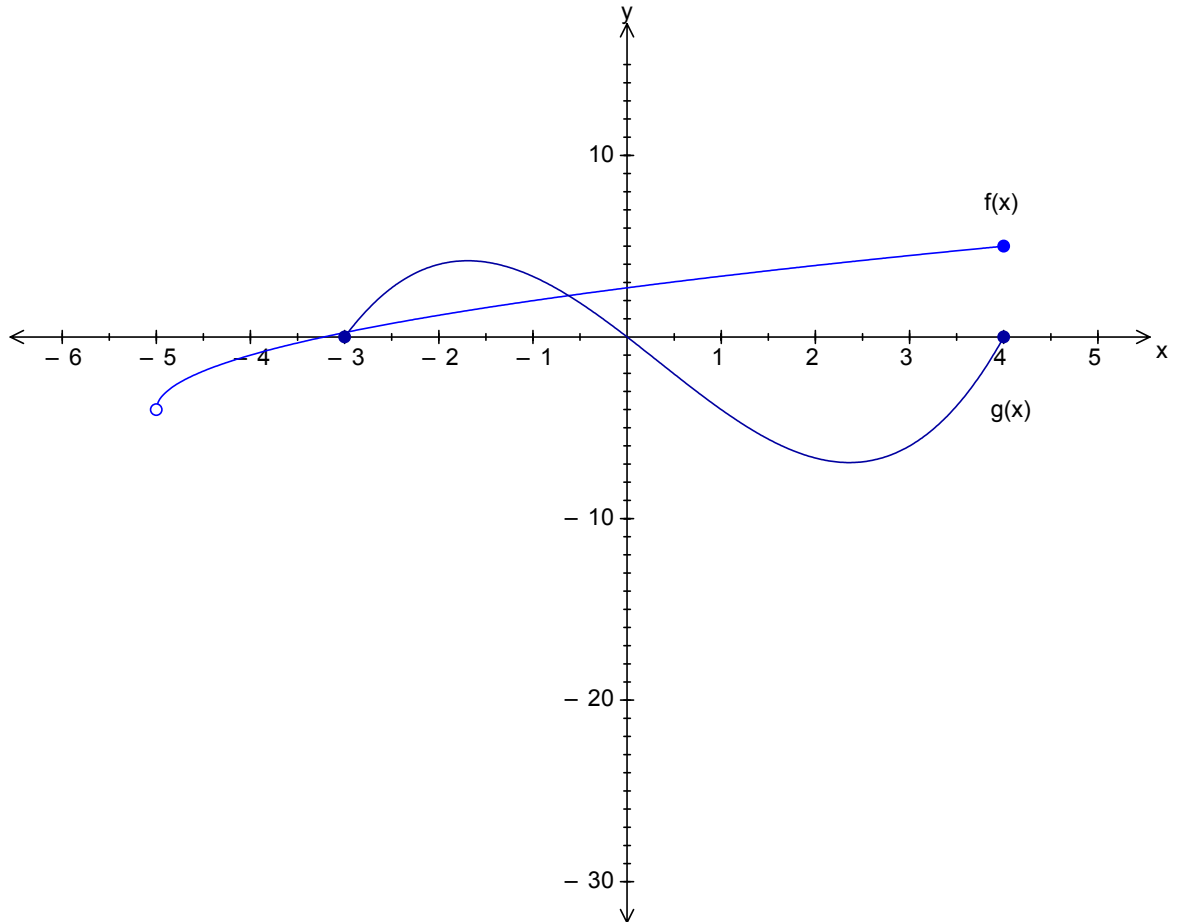**b.** State the domain and range of $f^{-1}(x)$.

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_____

1 mark

Question 4

Two functions are defined as: $f:(-5,4] \rightarrow R, f(x) = 3\sqrt{x+5} - 4$ and

$g:[-3,4] \rightarrow R, g(x) = \dfrac{x}{3}(x+3)(x-4)$. The graphs of these functions are shown below.

a. **On the same set of axes**, sketch the graph of $h(x) = f(x).g(x)$.

2 marks

b. State the domain of $h(x)$.

_____

_____

1 mark

TURN OVER

Question 5

a. If $f(x) = \dfrac{\left(3x^2 - 2\right)^4}{\cos(x)}$, find $f'(x)$.

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1 mark

b. Find the derivative of $y = x^2 e^{2x}$.

_____

_____

1 mark

c. Hence find $\int \left(xe^{2x} + x^2 e^{2x} + 1\right)dx$.

_____

_____

1 mark

Question 6

Solve the equation $\sqrt{3}\sin(3x) = \cos(3x)$ for $x \in [-\pi, \pi]$.

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3 marks

Question 7

a. Sketch the graph of $y = 2\tan\left(\dfrac{1}{2}\left(x - \dfrac{\pi}{2}\right)\right)$ for $x \in \left(-\dfrac{\pi}{2}, \dfrac{7\pi}{2}\right)$. Label the coordinates of all axial intercepts.
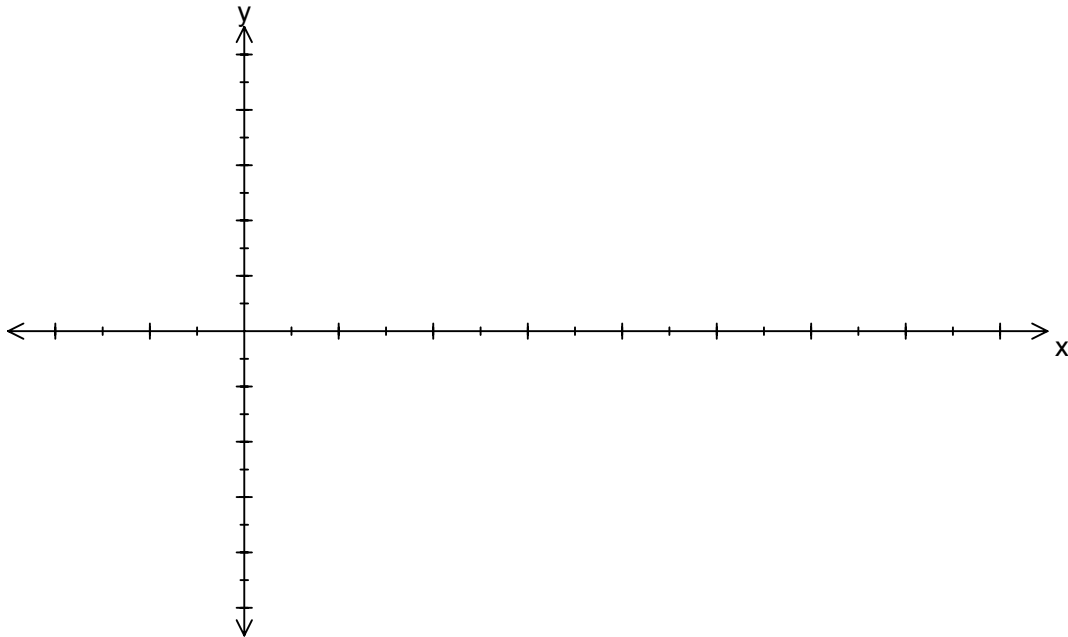
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3 marks

b. **On the same set of axes**, sketch $y = \left| 2\tan\left(\dfrac{1}{2}\left(x - \dfrac{\pi}{2}\right)\right) \right|$ for $x \in \left(-\dfrac{\pi}{2}, \dfrac{7\pi}{2}\right)$.

1 mark

TURN OVER

Question 8

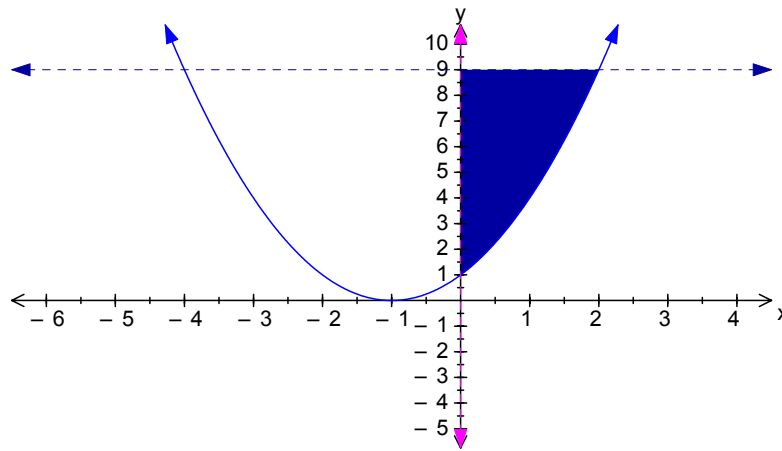Find the equation of the tangent to the curve $y = 3\ln(2x - 3)$ at the point where $x = 3$

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<div align="right">3 marks</div>

Question 9

Find the area between the graph of $y = (x+1)^2$, the right of the **y axis** and the line $y = 9$

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<div align="right">3 marks</div>

Question 10

A discrete probability distribution is given by the following table

x	0	1	2	3	4
p(x)	0.2	a	b	0.2	0.2

a. If $E(X) = 2.1$, find the values of a and b.

_____

_____

_____

_____

_____

2 marks

b. Find $E(2X + 1)$.

_____

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1 mark

TURN OVER

Question 11

Tests have shown that if a cat has milk on a particular day, there's a 90% chance that it will choose pellets on the next day. But if a cat has pellets on a particular day, there is an 80% chance that it will choose milk on the next day.

a. If Jim's cat had milk on Monday, find the probability that it will have pellets on Thursday. Give answer as a **fraction**.

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4 marks

Question 12

The heights of women are normally distributed with a mean of 160cm and a standard deviation of 8cm.

a. Between what values are approximately 95% of the women's heights?

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_____

1 mark

b. If $\Pr(H > 170) = 0.1$, then find the probability that a woman's height is less than 170cm, given that it is more than 160cm.

_____

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2 marks

END OF QUESTION AND ANSWER BOOK