



YEAR 11 MATHEMATICAL METHODS A (CAS)

Semester 1 Non-Technology Examination June 2009

NAME: _____ Class: JLB / PHE / PM

TIME: 60 minutes plus 10 minutes reading time.

Short-Answer Questions

There are **12 questions** in this examination. You must answer all questions. Follow the directions given in each question. Answer in the space provided in this BOOKLET.

Total 63 marks.

- No calculators of any type are allowed.
- DICTIONARIES of any type are not allowed.
- Unless otherwise stated, the diagrams in this booklet are not to scale.
- *Marks will be awarded for correct and logical working.*

Short-answer questions**1** Solve the following equations for x .

a) $4x - 3 = 3(6 - x)$

b) $\frac{9x+3}{2} = \frac{13x+7}{3}$

c) $x(x-3) = 4$

d) $|x+2| - 4 = 0$

2 + 2 + 2 + 2 = 8 marks**2** Find the coordinates of the points of intersection of the curve $y = x^2 + x - 2$ and the line $y = 3x + 1$.**4 marks**

3 Solve the following inequations for x .

a) $-3x + 4 > -1$

b) $x^2 - 5x + 6 \leq 0$

3 + 3 = 6 marks

4 Express $y = -2x^2 + 12x - 15$ in the form $y = a(x - h)^2 + k$ and hence state the coordinates of the turning point.

4 marks

5 Solve $2 \cos(x) = -\sqrt{3}$ for the domain $0 \leq x \leq 2\pi$.

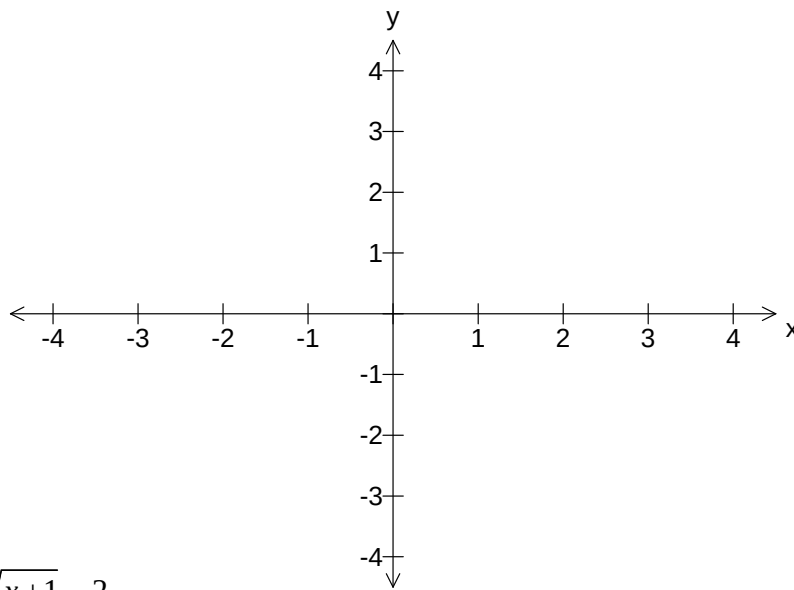
3 marks

6 Use the quadratic formula to solve $2x^2 - 2kx + 4k = 0$ for x in terms of k .

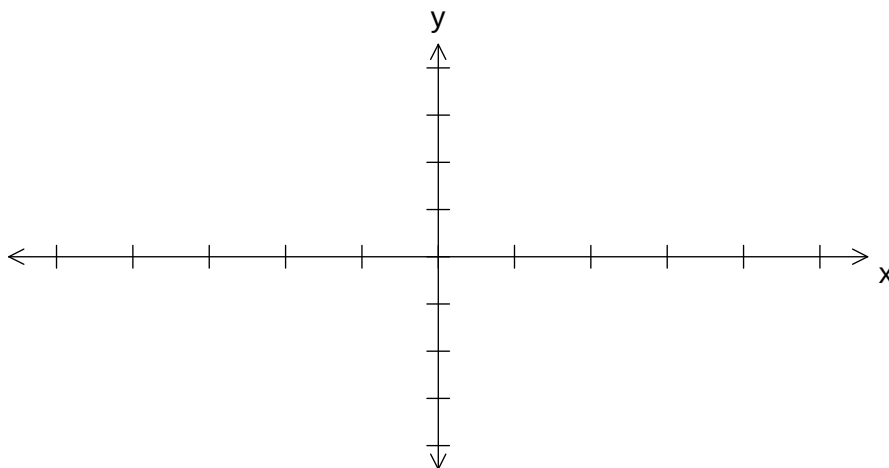
3 marks

7 Sketch the following graphs clearly labelling all asymptotes, intercepts and endpoints.

a) $y = \frac{-1}{(x+1)^2} + 1$

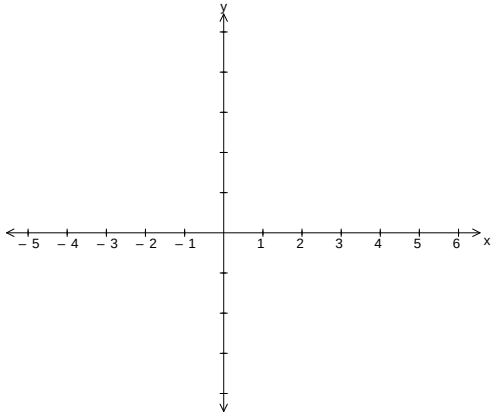


b) $y = \sqrt{x+1} - 2$



3 + 3 = 6 marks

8 Sketch the graph of $f(x) = -|x-1| + 2$ labelling all intercepts and the vertex.



4 marks

9a) Find the inverse function of $f : [2, \infty) \rightarrow \mathbb{R}$, $f(x) = (x-2)^2 + 1$.

9b) State the domain and range of the inverse function that you found in part a).

4+2 = 6 marks

10 For the two points $A(3, -6)$ and $B(-2, 4)$, find the following:

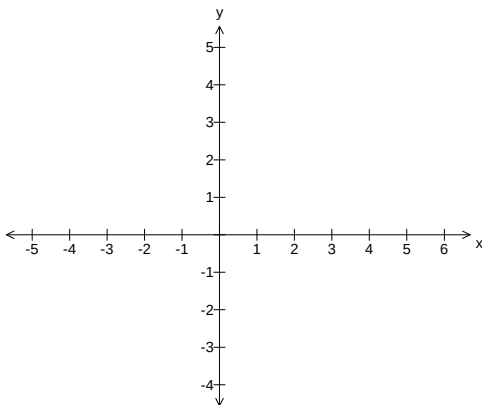
- a) the **exact** distance between A and B .
- b) the coordinates of the midpoint of the line joining A and B .
- c) the equation of the line joining A and B .
- d) the equation of the line perpendicular to the line joining A and B and passing through the point $(1, -2)$.

11 A parabola has its vertex is at $(1, 4)$ and y-intercept $(0, 2)$. Find the equation of this parabola.

3 marks

12a) State the radius and centre of the circle with equation $x^2 - 6x + y^2 + 4y + 4 = 0$.

12b) Sketch the graph of $x^2 - 6x + y^2 + 4y + 4 = 0$, labelling the centre and axial intercepts in **exact** form.



4 + 4 = 8 marks

End of examination ☺

11MMA CAS Formula Sheet

Gradient of a straight line joining two points: $m = \frac{y_2 - y_1}{x_2 - x_1}$.

General linear equation is $y = mx + c$, where m is the gradient and c is the y-intercept.

Equation of a straight line of gradient m , passing through (x_1, y_1) is $y - y_1 = m(x - x_1)$.

If two straight lines are **perpendicular** to each other the product of their gradients is -1 .
Eg. $m_1 \times m_2 = -1$.

Distance between two points $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

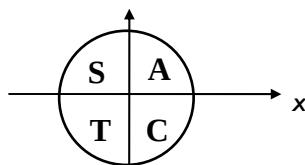
Midpoint of a line joining (x_1, y_1) and (x_2, y_2) is: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

A **quadratic function** is defined by $y = ax^2 + bx + c$ where a, b and c are constants.

The turning point of $y = ax^2 + bx + c$ is $x = -\frac{b}{2a}$, $y = f\left(-\frac{b}{2a}\right)$.

General quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Signs of trigonometric functions:



A = all positive, **S** = only sin positive, **T** = only tan positive, **C** = only cos positive.

Using symmetrical properties of trigonometric functions, it can be seen that:

$\sin(\pi - \theta) = \sin\theta,$	$\cos(\pi - \theta) = -\cos\theta,$	$\tan(\pi - \theta) = -\tan\theta$	for the second quadrant.
$\sin(\pi + \theta) = -\sin\theta,$	$\cos(\pi + \theta) = -\cos\theta,$	$\tan(\pi + \theta) = \tan\theta$	for the third quadrant.
$\sin(2\pi - \theta) = -\sin\theta,$	$\cos(2\pi - \theta) = \cos\theta,$	$\tan(2\pi - \theta) = -\tan\theta$	for the fourth quadrant.
$\sin(-\theta) = -\sin\theta,$	$\cos(-\theta) = \cos\theta,$	$\tan(-\theta) = -\tan\theta$	for the fourth quadrant.