

Student Name.....

Teacher (circle one) JOR CWE

Homegroup



MATHEMATICAL METHODS (CAS) UNIT 1

EXAMINATION 1

Thursday, 4th June, 2015

Reading Time: 5 minutes

Writing time: 1 hour

Instructions to students

This exam consists of **13** questions.

All questions should be answered in the spaces provided.

There is a total of **61** marks available.

A decimal approximation will not be accepted if an exact answer is required.

Where more than one mark is allocated to a question working must be shown.

Students **may not** bring any notes or any calculators into this exam.

Diagrams in this exam are not to scale except where otherwise stated.

FORMULAS

Function and Graphs

Distance formula $d_{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ Midpoint formula $x_M, y_M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Straight line graphs

General equation $y = mx + c$ Gradient $m = \frac{y_2 - y_1}{x_2 - x_1}$

Equation through point (x_1, y_1) given by $y - y_1 = m(x - x_1)$

Difference/sum of squares and cubes

$$a^2 - b^2 = (a + b)(a - b)$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Expansions

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

1 Solve these equations for x :

(a) $3x^3 + 81 = 0$

(b) $\frac{1}{x+2} = \frac{2}{6x-5}$

2 + 3 = 5 marks

2 Use the factor theorem and division to factorise $W(x) = x^3 - 5x^2 - 2x + 24$

5 marks

3 Let $f(x) = -3x^4 + 2x^2 - 3$

Evaluate:

i) $f(-1)$

ii) $f(\sqrt{2})$

2 marks

4 Expand

(a) $(2x-1)(x+1)(1-x)$

(b) $(3x+2)^3$

2 + 2 = 4 marks

5 Factorise the following completely

$4x^2 + 2x - 2$

$3x^3y - 12xy^3$

$x^3 - 8$

3 x 2 = 6 marks

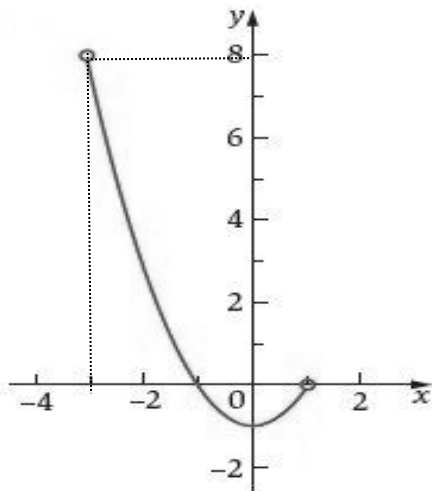
6 Simplify this expression using appropriate logarithm or index laws

a) $\frac{25^{x+3} \times 5^{6x}}{125^{2x-1}}$

b) $3\log_3 18 + \log_3 2 - 2\log_3 12$

3+3=6 marks

7 State the domain and range of this graph



2 marks

8 For the function $f : D \rightarrow R$, $f(x) = 2(x - 2)^2 + 3$ find D , the largest domain for which the function is 1:

1

2 marks

9 List all the transformations that have been applied to the graph of $y = x^2$ to transform it into the graph of $y = \frac{1}{2}(x + 4)^2 + 1$

3 marks

10 Consider the points: A (5,-1) and B (1,3)

(a) Find the distance from A to B.
Express your answer in simplest surd form.

(b) Find the midpoint of the line segment AB

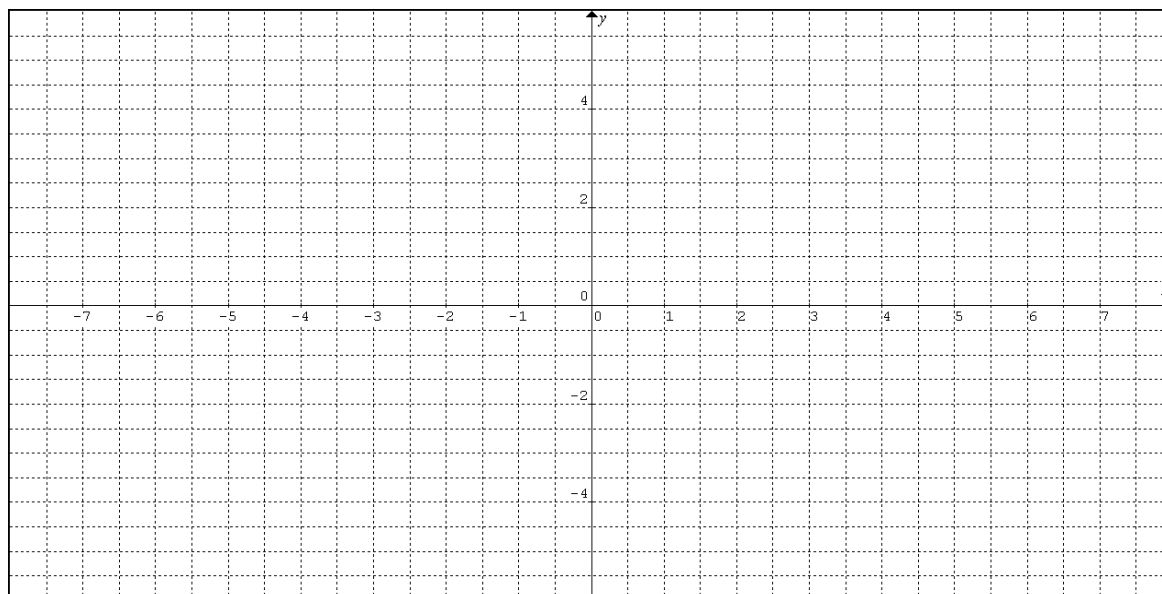
(c) Show that the point A(5,-1) lies on the line with equation $y = 2x - 11$.

(d) Find the equation of the line that passes through the point A(5,-1) and is perpendicular to the line $y = 2x - 11$. Leave your answer in the form $ay + bx + c = 0$

11 Sketch the graphs of the following, labelling axes intercepts with their coordinates.

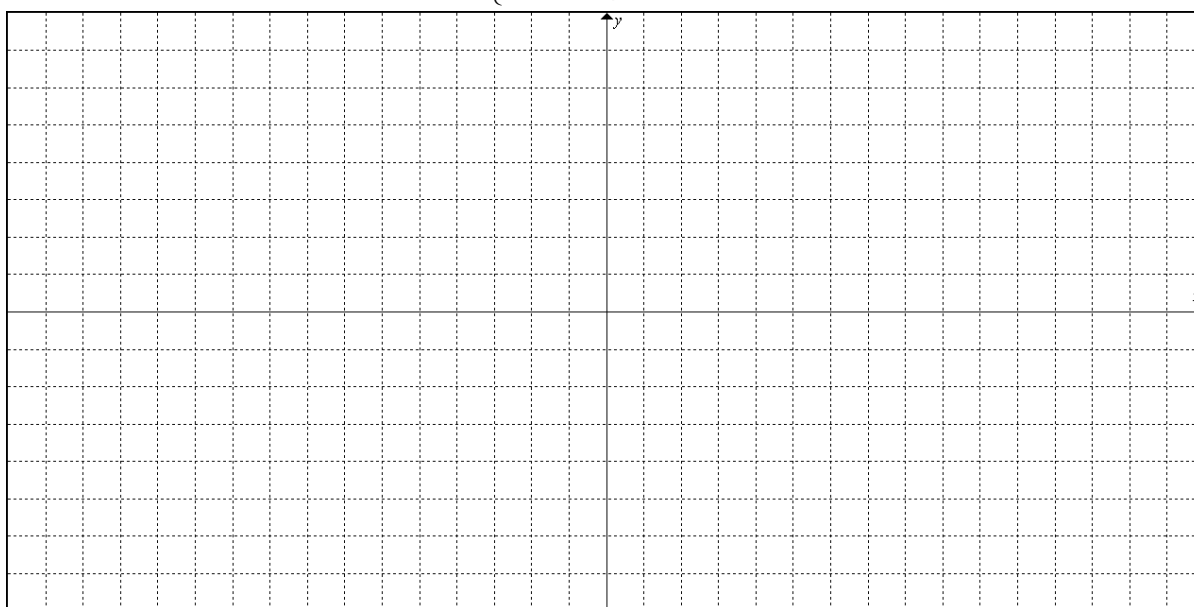
(a) $2y + x - 4 = 0$

(b) $x = -2$



2 marks

12 (a) Sketch the graph of $f(x) = \begin{cases} 4 - x & , \quad x < 0 \\ x^2 - 4 & , \quad x \geq 0 \end{cases}$



(b) What is the domain and range of $f(x)$?

(c) Find the value of $f(3)$.

(d) Is $f(x)$ a function or a relation? Give reasons

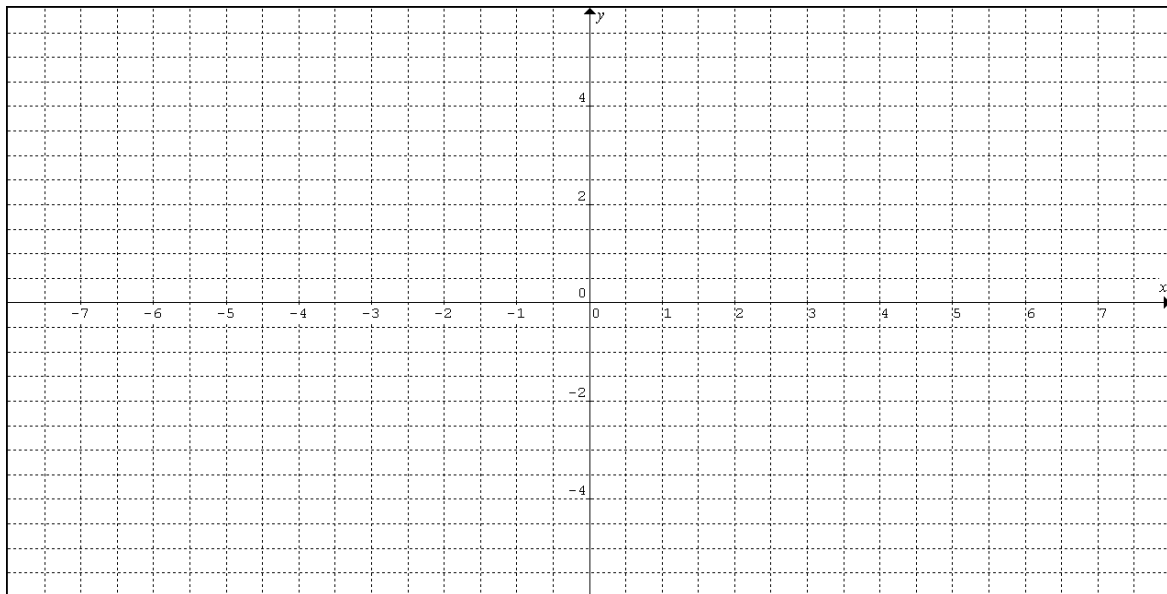
3 + 2 + 1 + 2 = 8 marks

13 Consider the curve with equation. $y = \frac{1}{x-3} - 4$

(a) State the equations of the asymptotes.

(b) What are the coordinates of any axes intercepts?

(c) Sketch the curve. Label all axes intercepts with their co-ordinates and asymptotes with their equations.



2 + 4 + 3 = 9 marks