

Time: 90 Minutes

Instructions: 1. Attempt all questions

2. Write your answers on your own paper

3. All necessary working must be shown

4. Marks will be deducted for careless or badly arranged work

QUESTION 1 (22 marks)

(a) Sketch each of the following curves on separate number planes

(i) $y = x^2 - 4$ 2

(ii) $y = |x + 1|$ 2

(iii) $x^2 + y^2 = 4$ 2

(iv) $y = \frac{1}{x + 2}$ 2

(b) State whether each of the above curves are functions? 4

(c) State domain and range of

(i) $y = 2^{-x}$ (ii) $y = |x + 1|$ (iii) $y = \frac{1}{x + 2}$ (iv) $x^2 + y^2 = 4$ 8

(d) State the domain of $y = \frac{1}{\sqrt{8 - 2x}}$ 2

QUESTION 2 (17 marks)

(a) If $g(x) = x^2 - 4x$ find

(i) $g(2)$

(ii) $g(1-w)$

(iii) Find x if $g(x) = -3$ 6

(b) Given that $f(x) = \begin{cases} 2x - 4 & \text{if } x \geq 1 \\ x - 3 & \text{if } -1 < x < 1 \\ -4x^2 & \text{if } x \leq -1 \end{cases}$

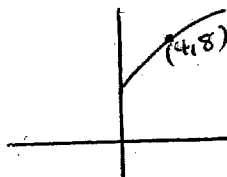
Find (i) $f(2)$ 1

(ii) $f(0)$ 1

(iii) $f(-1)$ 1

(iv) Sketch the function 3

(c)



$y = f(x)$ is an even function

(i) Redraw this function and complete the graph 2

(ii) Find $f(4) + f(-4)$ 1

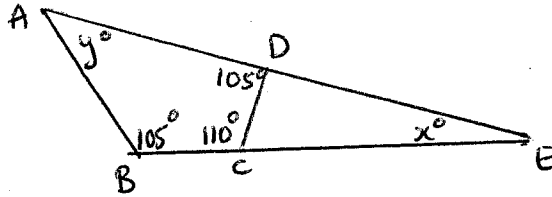
(d) Prove that $f(x) = x^3 - 4x$ is an odd function 2

QUESTION 3 (13 marks)

(a) Find the size of each interior angle of a regular octagon

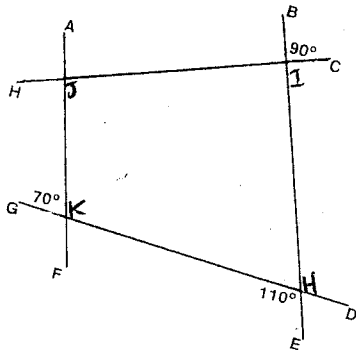
2

(b) Find x and y giving reasons



4

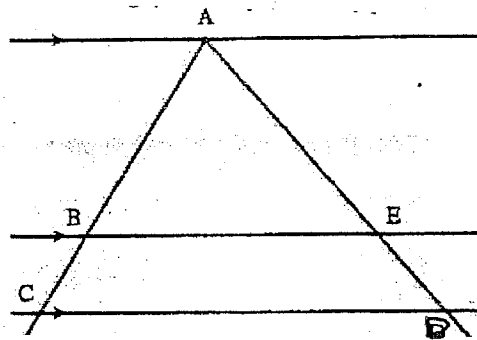
(c) Determine whether AF and BE are parallel with reasons



3

(d)

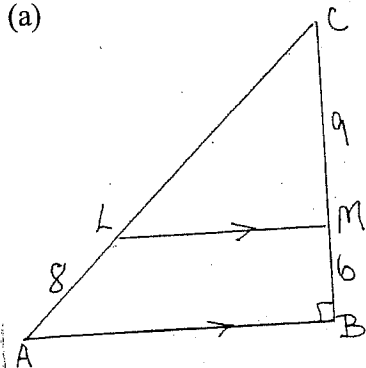
$AB=8m, BC=3m, ED=5m$
Find AD giving reasons



4

QUESTION 4 (11 marks)

(a)



(i) Find LC with reasons

2

(ii) Hence find AB as a surd

2

(b) A triangle has sides 12cm, 35cm, 37cm. Prove it is a right angled triangle.

2

(c) A rhombus has perimeter 136cm and one diagonal is 60cm.

(i) Find the other diagonal as a surd

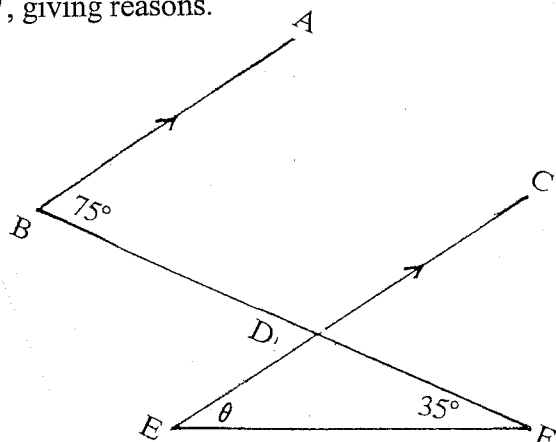
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(ii) Find the area of the rhombus

2

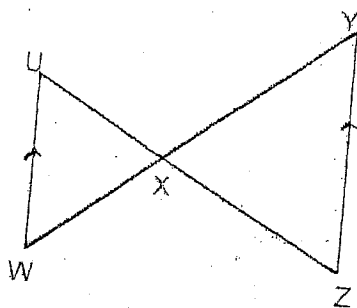
QUESTION 5 (17 marks)

(a) Find the size of θ , giving reasons.



4

(b) The lines UZ and WY intersect at X as in the figure, UW is 10cm, WX is 8cm, UX is 7cm and XZ is 12cm.



(i) Draw a neat sketch and mark it with all the given information.

1

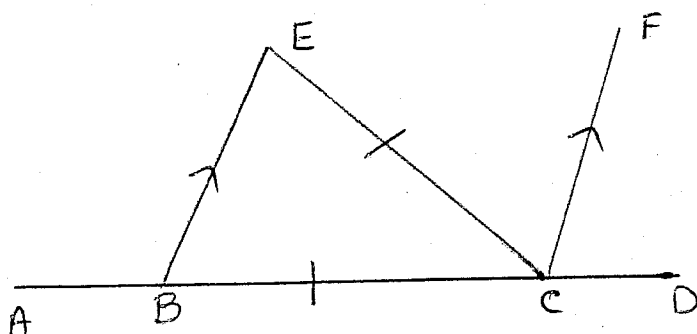
(ii) Prove that triangles UWX and XYZ are similar.

3

(iii) Hence or otherwise find the length of ZY with reasons

3

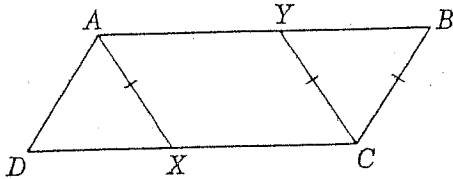
(c) ABCD is a straight line. Prove that CF bisects $\angle ECD$ giving clear reasons



6

QUESTION 6 (20 marks)

(a) ABCD is a parallelogram. The point X lies on CD the point Y lies on AB and $AX=CY=BC$ as shown in the diagram



(i) Copy the diagram onto your answer page

(ii) Explain why $\angle ADX = \angle CBY$

1

(iii) Show that $AD=AX$

3

(iv) Show that triangles ADX and CBY are congruent

4

(v) Hence prove that AYCX is a parallelogram

4

(b) ABCD is a rhombus, AX is perpendicular to BC and intersects BD at L

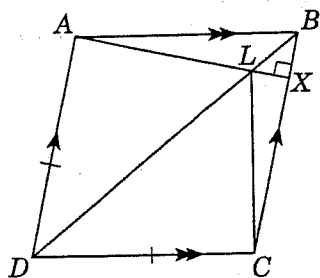


Figure not to scale

(i) Copy the diagram onto your answer paper and state why

$$\angle ADB = \angle CDB$$

1

(ii) Prove that the triangles ALD and CLD are congruent

4

(iii) Show that $\angle DAL$ is a right angle with reasons

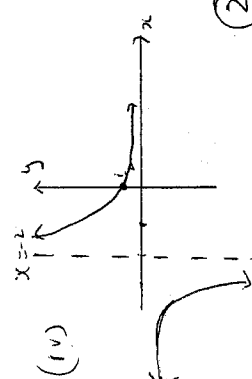
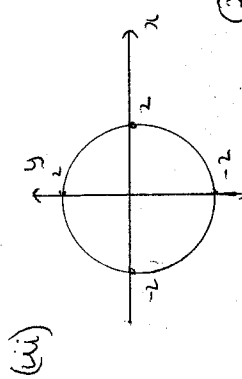
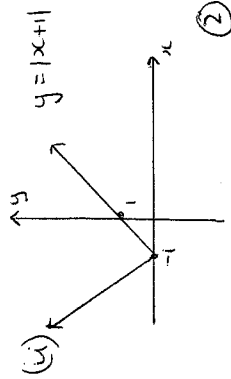
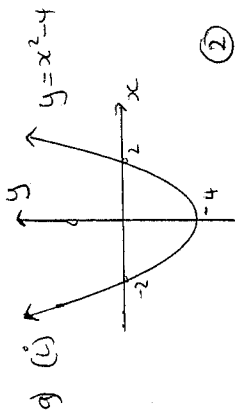
1

(iv) Hence or otherwise find the size of $\angle LCD$ with reasons

2

Year 11 Mathematics Task 3

Question 1



- (b) (i) function
 (ii) function
 (iii) not function
 (iv) function

Question 1

- (c) Domain: x all real
 Range: $y > 0$
- (i) Domain: x all real
 Range: $y \geq 0$
- (ii) Domain: all real, $x \neq -2$
 Range: all real, $y \neq 0$
- (iv) Domain: $-2 \leq x \leq 2$
 Range: $-2 \leq y \leq 2$

(d) Domain $8 - 2x > 0$
 $-2x > -8$
 $x < 4$

Question 2

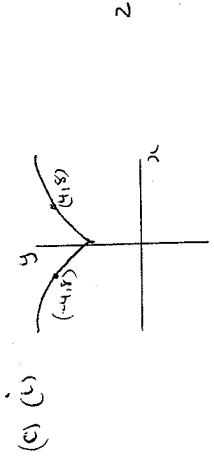
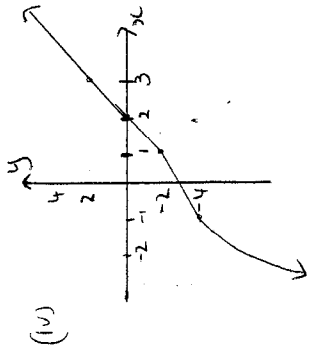
(a) $g(2) = 4 - 8 = -4$

(ii) $g(1-w) = (1-w)^2 - 4(1-w)$
 $= 1 - 2w + w^2 - 4 + 4w$
 $= -3 + 2w + w^2$

(iii) $x^2 - 4x = -3$
 $x^2 - 4x + 3 = 0$
 $(x-3)(x-1) = 0$
 $x = 1 \text{ or } 3$

Question 2

- (b) (i) $f(2) = 0$
 (ii) $f(0) = -3$
 (iii) $f(-1) = -4$



(ii) $f(4) + f(-4) = 16$

(d) $f(-x) = (-x)^3 - 4(-x)$
 $= -x^3 + 4x$
 $= -(x^3 - 4x)$
 $= -f(x)$

Question 3

(a) $(8-2) \times 180 = 135^\circ$

Question 3

(b) $y + 105 + 110 + 105 = 360$
 (angle sum of quad)
 $y = 40^\circ$

$x + 40 + 105 = 180$
 (angle sum of triangle)
 $x = 35^\circ$

(c) $\angle IHK = 90^\circ$ (straight angle)
 $\angle IJK = \angle JKG = 70^\circ$
 $\therefore AF \parallel BE$ (corresponding angles are equal)

(d) $\frac{8}{3} = \frac{x}{5}$ (ratio of intercepts)

$x = \frac{40}{3}$

$AD = \frac{40}{3} + 5$

$= 18 \frac{1}{3} \text{ m}$

Question 4

(a) (i) $\frac{LC}{8} = \frac{9}{6}$ (ratio of intercepts)

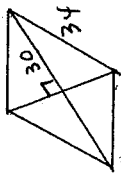
$LC = 12$ (2)

(ii) $\frac{AB^2}{AB} = \frac{20^2 - 15^2}{\sqrt{175}}$ (2)

(b) LHS = $12^2 + 35^2$
 $= 144 + 1225$
 $= 1369$
 $= 37^2$
 $= RHS$

\therefore triangles right angled

(c)



(i) $x^2 = 34^2 - 30^2$
 $= 256$

$x = 16$

\therefore diagonal is 32cm

(ii) $\frac{1}{2} \times 32 \times 60 = 960 \text{ cm}^2$

Question 5

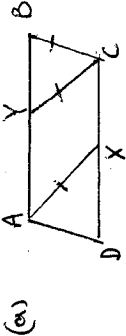
(a) $\hat{C}PB = 105^\circ$ (obtuse angle)
 $AB \parallel CD$

$\hat{F}DE = 105^\circ$ (vertically opposite angle)

$\therefore \theta + 35 + 105 = 180$ (angle sum of \triangle)

$\therefore \theta = 40^\circ$

Question 6



(i) opposite angles of parallelogram (1)

(ii) $BC = AD$ (opposite sides of parallelogram)
 $AX = BC$ (given)

$\therefore AX = AD = BC$ (3)

(iv) $\hat{A}DX = \hat{Y}BC$ (from part (i))

$\hat{A}DX = \hat{A}DX$ (angles opposite equal sides of \triangle)

opposite equal sides of \triangle

$\hat{C}BY = \hat{C}BY$ (angles opposite equal sides of \triangle)

$\therefore \hat{A}DX = \hat{C}BY = \hat{C}BY$

$CY = AX$ (given)

$\therefore \triangle ADX \cong \triangle CBY$ (AAS)

(4)

(vi) $DX = BX$ (corresponding sides of congruent triangles)

$AB = DC$ (opposite sides of parallelogram)

$AB = AY + YB$

$DC = DX + XC$

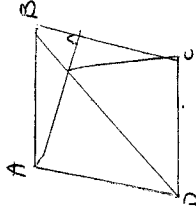
$\therefore AY + YB = DX + XC$

$\therefore AX = YC$ (given)

$AXYC$ is a rhombus

\therefore two pairs opposite sides equal

(4)



(v) In a rhombus diagonals bisect angle through which they pass.

(vi) $AD = DC$ (equal sides of rhombus)

$\hat{A}DB = \hat{C}DB$ (from part (i))

LD common

$\therefore \triangle ADO \cong \triangle CDO$ (SAS) 4

(iii) $\hat{A}DL = 90^\circ$ (alt angle)
 $AD \parallel BC$ (1)

(iv) $\hat{L}ED = 90^\circ$ (corresponding angles of congruent \triangle 's)