Girraween High School Year 11 Mathematics 2006 Task 3

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

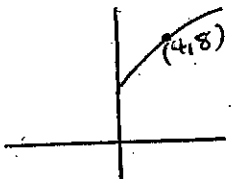
Find (i) f(2) 1

(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

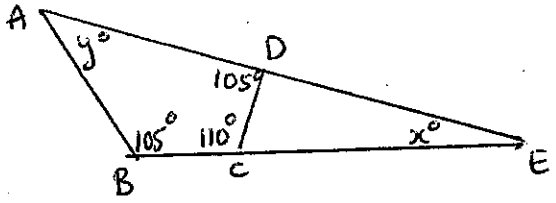
(ii) Find f(4) +f(-4) 1

(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



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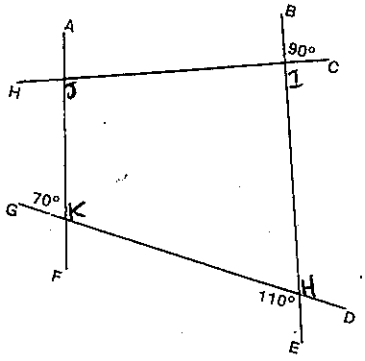
(c) Determine whether AF and BE are parallel with reasons



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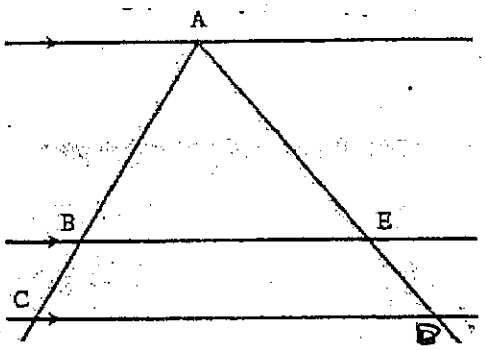
(d)

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



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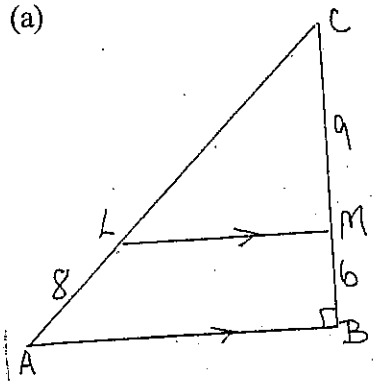
QUESTION 4 (11 marks)

(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

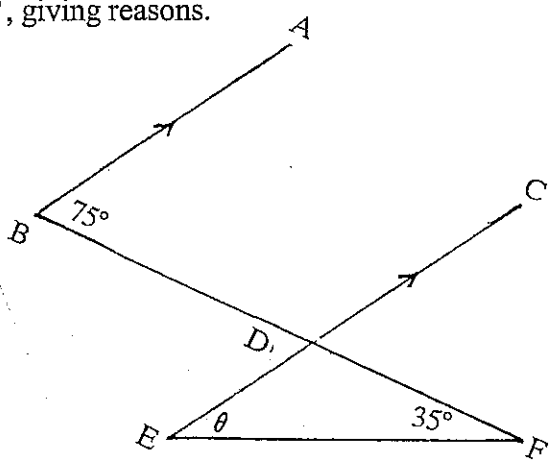
(c) A rhombus has perimeter 136cm and one diagonal is 60cm.

(i) Find the other diagonal as a surd 3

(ii) Find the area of the rhombus 2

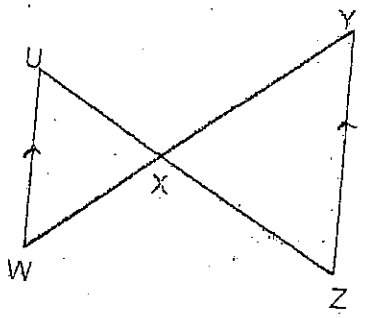
QUESTION 5 (17 marks)

(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.

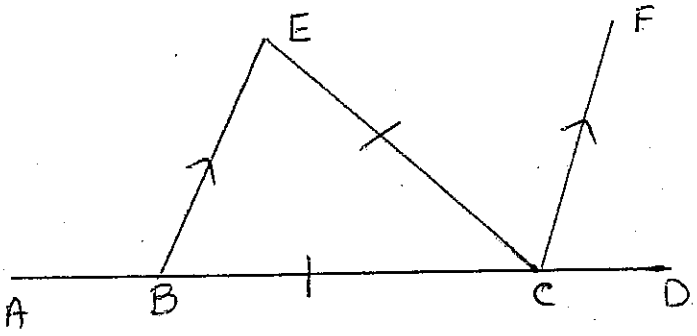


(i) Draw a neat sketch and mark it with all the given information. 1

(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



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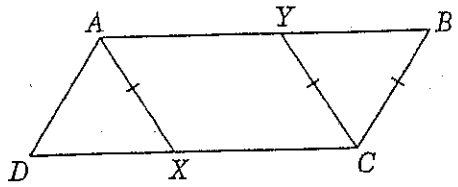
QUESTION 6 (20 marks)

(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

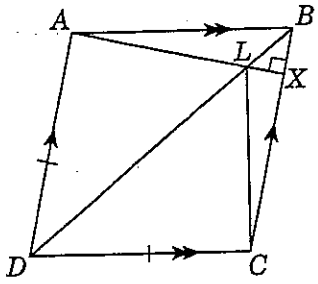


Figure not to scale

(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

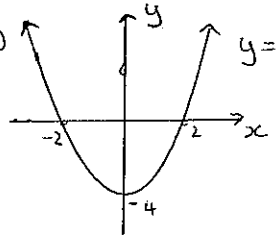
(iii) Show that $\angle DAL$ is a right angle with reasons 1

(iv) Hence or otherwise find the size of $\angle LCD$ with reasons 2

Year 11 Mathematics Task 3

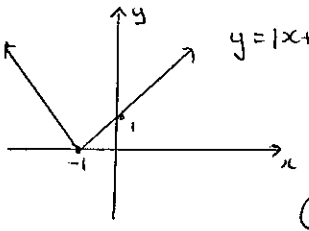
Question 1

a) (i)



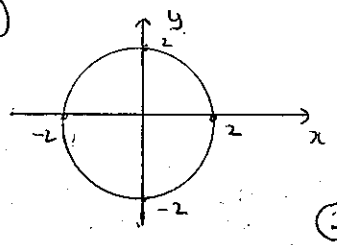
$y = x^2 - 4$ (2)

(ii)



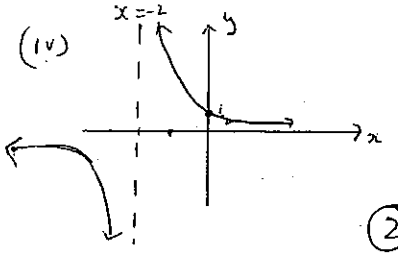
$y = |x+1|$ (2)

(iii)



(2)

(iv)



(2)

(b) (i) function
(ii) function
(iii) NOT function
(iv) function (4)

Question 1

(c) Domain : x all real
Range : $y > 0$ (2)

(ii) Domain : x all real
Range $y \geq 0$ (2)

(iii) 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 $8 - 2x > 0$

$-2x > -8$

$x < 4$ (2)

Question 2

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

$= -4$ (2)

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

$= 1 - 2w + w^2 - 4 + 4w$

$= -3 + 2w + w^2$ (2)

(iii) $x^2 - 4x = -3$

$x^2 - 4x + 3 = 0$

$(x-3)(x-1) = 0$

$x = 1$ or 3 (2)

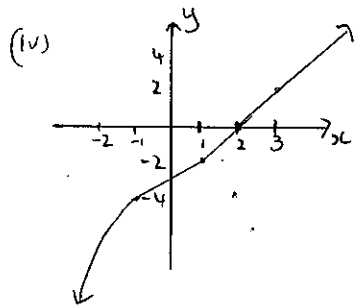
Question 2

(b)(i) $f(2) = 0$ 1

(ii) $f(0) = -3$ 1

(iii) $f(-1) = -4$ 1

(iv)



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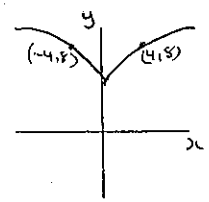
(c) (i)



2

(ii) $f(4) + f(-4) = 16$ 1

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

$= -x^3 + 4x$

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

$= -f(x)$ 2

Question 3.

(a) $\frac{(8-2) \times 180}{8} = 135°$ (2)

Question 3

(b) $y + 105 + 110 + 105 = 360$ (angle sum of quad)

$y = 40°$ (2)

$x + 40 + 105 = 180$ (angle sum of triangle)

$x = 35°$ (2)

(c) $\angle IHK = 90°$ (straight angle)

$\angle IHK = \angle JKG = 70°$

$\therefore AF \parallel BE$ (corresponding angles are equal)

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

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

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

$= 18\frac{1}{3}$m (4)

Question 4

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

$LC = 12$ (2)

(ii) $AB^2 = 20^2 - 15^2$

$AB = \sqrt{175}$ (2)

(b) LHS $= 12^2 + 35^2$

$= 144 + 225$

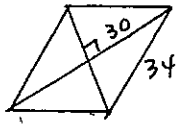
$= 1369$

$= 37^2$

$=$ RHS

$\therefore$ triangle right-angled

(c)



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

$= 256$

$x = 16$

$\therefore$ diagonal is 32cm

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

Question 5

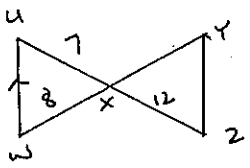
(a) $C\hat{D}B = 105°$ (co-interior angles AB || CD)

$F\hat{D}E = 105°$ (vertically opposite angle)

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

$\therefore \theta = 40°$.

(b)



(1)

(i) $Y\hat{X}Z = U\hat{X}W$ (vertically opposite angles)

$W\hat{U}X = Y\hat{Z}X$ (alternate angles, $UW \parallel YZ$) &

$\triangle UXW \,|||\, \triangle YXZ$ (equiangular)

(3)

(ii) $\frac{24}{10} = \frac{12}{7}$ (proportional sides of similar triangles)

$\therefore 2Y = 17\frac{1}{7}$

(c) Let $B\hat{E}C = x$

$\therefore E\hat{C}F = x$ (alternate angles $BE \parallel CF$)

$E\hat{B}C = x$ (base angles isosceles $\triangle$, $EC = BC$)

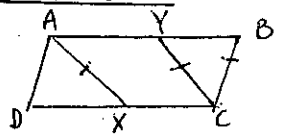
$F\hat{C}D = x$ (corresponding angles $BE \parallel CF$)

$\therefore E\hat{C}F = F\hat{C}D = x$

so CF bisects $B\hat{C}D$

Question 6

(a)



(ii) opposite angles of parallelogram (1)

(iii) $BC = AD$ (opposite sides of parallelogram)

$AX = BC$ (given)

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

(iv) $A\hat{D}X = Y\hat{B}C$ (from part i)

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

$B\hat{B}Y = C\hat{Y}B$ (angles opposite equal sides of $\triangle$).

$\therefore A\hat{X}D = C\hat{Y}B = C\hat{B}Y$.

$CY = AX$ (given)

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

(4)

(v) $DX = BY$ (corresponding sides of congruent triangles)

$AB = DC$ (opposite sides of parallelogram)

$AB = AY + YB$

$DC = DX + XC$.

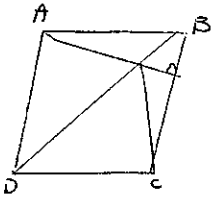
$\therefore AY = XC = (AB - BY)$

$\therefore AX = YC$ (given)

AXYC is a ... eg two pairs opposite sides equal

(4)

(b)



(i) If a rhombus diagonals bisect angle through which they pass.

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

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

LD common

$\triangle ALD \equiv CLD$ (SAS) 4

(iii) $D\hat{A}L = 90°$ (alternate angles, $AD \parallel BC$) (1)

(iv) $L\hat{C}D = 90°$ (corresponding angles of congruent $\triangle$'s).