SYDNEY TECHNICAL HIGH SCHOOL

MATHEMATICS DEPARTMENT

YEAR 11 2 UNIT ASSESSMENT TASK 2

JULY 2002

Time Allowed: 70 minutes

Name: _____

Teacher: _____

Instructions:

- Show all necessary working
- Marks may be withheld awarded for careless or badly arranged work
- Calculators may be used
- Marks shown are a guide and may be varied
- Hand in this question paper on top of your correctly ordered solutions
- Start each question on a new page.

Question	1	2	3	4	5	6	7	8	Total
Marks									

Question 1 **Marks**

a) (i) For the function $y = \frac{1}{x+1}$, write down the value of x at which the function doesn't exist. As x approaches $\pm\infty$, y approaches which number? **2**

(ii) Find the y intercept **1**

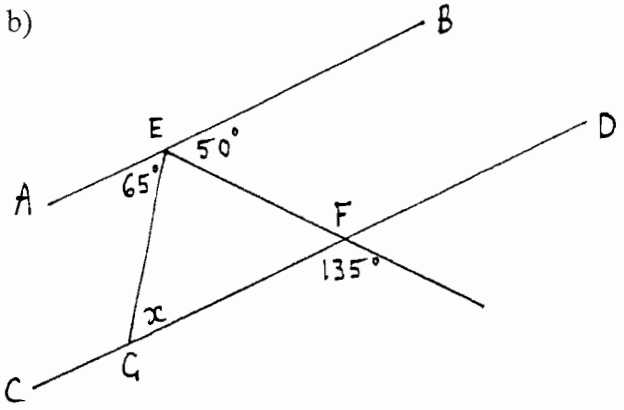
(iii) Hence sketch the curve showing the asymptotes and y intercept **3**

b) Solve for $0 \le x \le 90°$: **2**
$\sin 60° = \cos (x+10)°$

Question 2

a) Shade the region on the number plane satisfying: **3**
$x^2 + y^2 \le 4$ and $y < 2x$

b)



(i) Find x giving reasons **2**

(ii) Hence deduce whether AB ∥ CD **1**

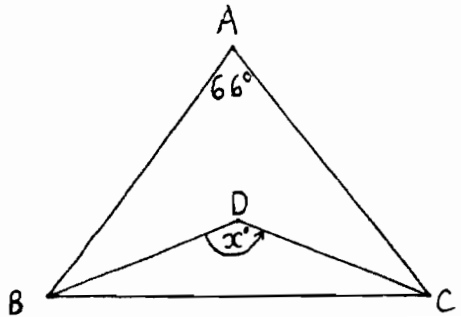
c) Evaluate $\sin(-135)°$ leaving your answer in exact form **2**

Question 3

a) (i) Sketch $y = |x-2|$ and $y = 3$ on the same number plane diagram **2**

(ii) Hence or otherwise solve $|x-2| = 3$ **2**

b)



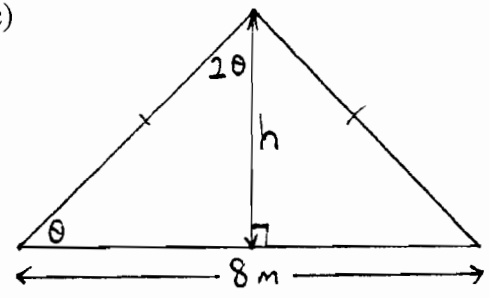
In Δ ABC, DB bisects $\angle$ ABC and DC bisects $\angle$ ACB. **3**
Copy the diagram onto your answer sheet showing all the above information and find the value of x giving reasons.

Question 4

a) A regular polygon has each interior angle equal to 150°. Find the sum of all its interior angles. **2**

b) Simplify $(\sec\vartheta - 1)(\sec\vartheta + 1)$ **2**

c)



(i) Find the size of ϑ to the nearest degree **1**

(ii) Find the length h correct to one decimal place **2**

Question 5

a) If A is acute and $\tan A = \frac{5}{3}$, draw a right angled triangle and find

(i) the exact values of $\sin A$ and $\cos A$ **2**

(ii) Hence show that $\sin A = \sqrt{1 - \cos^2 A}$ **2**

b) Prove the identity $\dfrac{\cos\vartheta}{1 + \sin\vartheta} = \sec\vartheta(1 - \sin\vartheta)$ **3**

Question 6

Let A and B be the points (0, 1) and (2, 3) respectively

(i) Find the coordinates of the midpoint of AB **1**

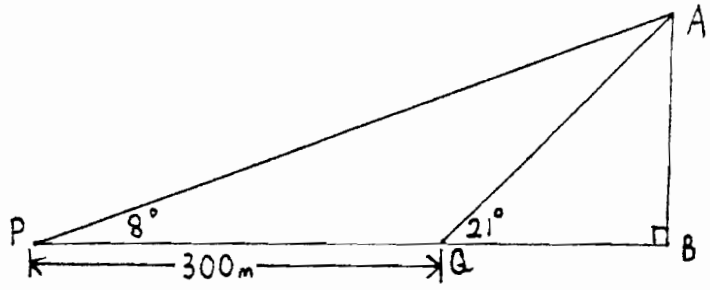
(ii) Find the slope of the line AB **1**

(iii) Find the equation of the perpendicular bisector of AB **3**

(iv) The point P lies on the line $y = 2x - 9$ and is equidistant from A and B. Using your answer to part (iii) or otherwise, find the coordinates of P. **2**

Question 7

a)



From a position P, Claudia finds that the angle of elevation of the top A, of a billboard AB is 8°. After walking 300m directly towards the billboard to the point Q she finds that the angle of elevation of A is 21°.

(i) Copy the diagram onto your answer sheet and find $\angle PAQ$. **1**

(ii) Calculate the length of AQ (nearest metre) **2**

(iii) Find the height of the billboard (nearest metres) **2**

b) Solve $\tan\vartheta = \frac{-1}{\sqrt{3}}$ if $0 \le \vartheta \le 360°$ **2**

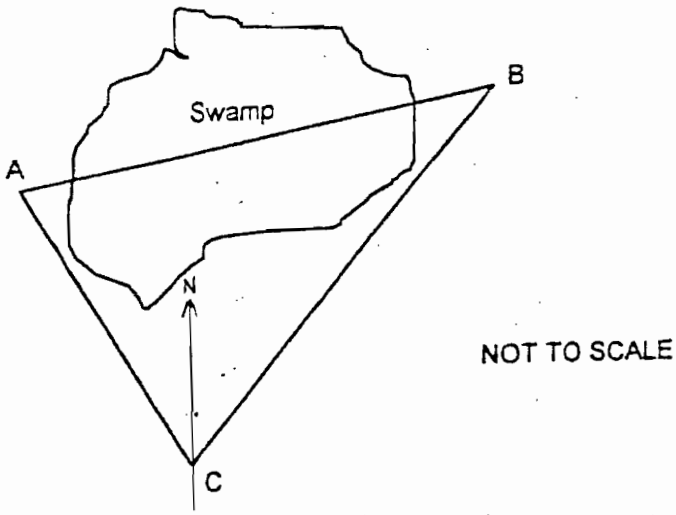
Question 8

a) Find the shortest distance between the parallel lines **3**

$3x - 4y + 7 = 0$ and
$3x - 4y - 3 = 0$

b) Find the exact value of cosec300° **2**

c) **3**



NOT TO SCALE

The diagram shows two points A and B on opposite sides of a crocodile infested swamp. From a point C a surveyor notes that the bearings to A and B are 340° and 036° respectively. The distances AC and BC were then measured and found to be 180 metres and 212 metres respectively.

(i) Copy the diagram showing this information.

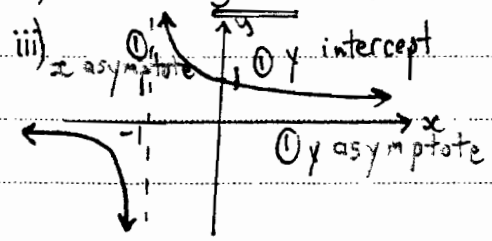
(ii) Calculate the distance from A to B across the swamp (nearest metre).

QUESTION 1

a) i) $x = -1$ ①

$y \to 0$ ①

ii) $x = 0 \quad y = 1$ ①

iii) 

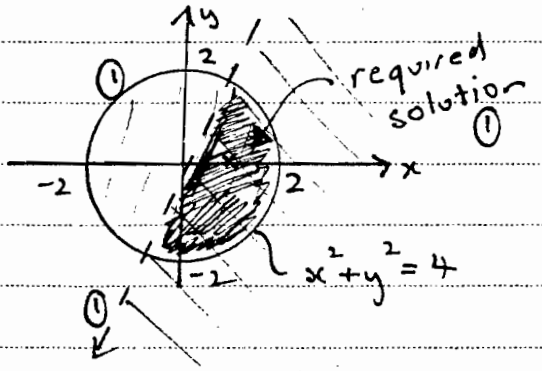
① ① ①

b) $\sin 60^\circ = \cos (x+10)^\circ$

$\therefore x + 10 + 60 = 90^\circ$ ①

$x = 20^\circ$ ①

QUESTION 2

a) 

① ①

① test (1,0)

$y < 2x$

b) i)

$F\hat{E}G = 65^\circ$ (supp L's)

$\angle EFG = 45^\circ$ (supp L's) ①

$x = 70^\circ$ ($\angle$ sum of $\Delta = 180^\circ$) ①

ii) AB not ∥ CD

(alt L's not equal) ①

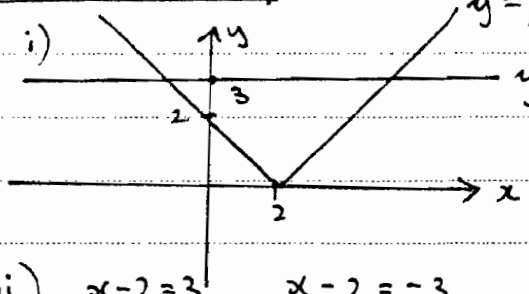
c) $\sin(-135)^\circ = \sin 225^\circ$ ①

$= \sin(180+45)^\circ$

$= -\sin 45$

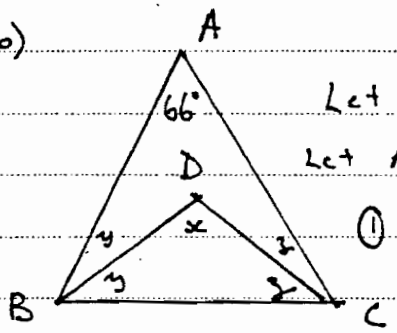
$= -1/\sqrt{2}$ ①

QUESTION 3

a) i) 

ii) $x - 2 = 3 \qquad x - 2 = -3$

$x = 5$ ① $\qquad x = -1$ ① or from sketch

b) 

Let $A\hat{B}D = D\hat{B}C = y$

Let $A\hat{C}D = D\hat{C}B = z$ ①

$2y + 2z = 114^\circ$ (angle sum Δ)

$y + z = 57^\circ$ ①

$\therefore x = 123^\circ$ (angle sum Δ BDC) ①

QUESTION 4

a) int angle $= 150^\circ$

$\therefore$ ext angle $= 30^\circ$ ①

$\frac{360}{30} = 12 \quad \therefore$ 12 sided polygon

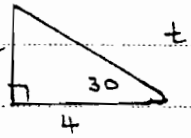
Int angle sum $= 1800^\circ$ ①

b) $(\sec\theta - 1)(\sec\theta + 1)$

$= \sec^2\theta - 1$ ①

$= \tan^2\theta$ ①

c) i) $\theta = 30^\circ$ (angle sum Δ) ①

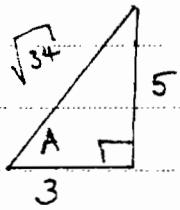
ii) 

$\tan 30 = \frac{h}{4}$

$h = 2.3$ ①

QUESTION 5

a) $\tan A = \frac{5}{3}$



i) $\sin A = \frac{5}{\sqrt{34}}$ ①

$\cos A = \frac{3}{\sqrt{34}}$ ①

ii) RHS $= \sqrt{1 - \cos^2 A}$

$= \sqrt{1 - \left(\frac{3}{34}\right)^2}$

$= \sqrt{1 - \frac{9}{34}}$ ①

$= \sqrt{\frac{25}{34}}$

$= \frac{5}{\sqrt{34}}$ ①

$=$ LHS

b)

LHS $= \frac{\cos\theta}{1+\sin\theta}$ ①

$= \frac{\cos\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}$

$= \frac{\cos\theta(1-\sin\theta)}{1-\sin^2\theta}$

$= \frac{\cos\theta(1-\sin\theta)}{\cos^2\theta}$ ①

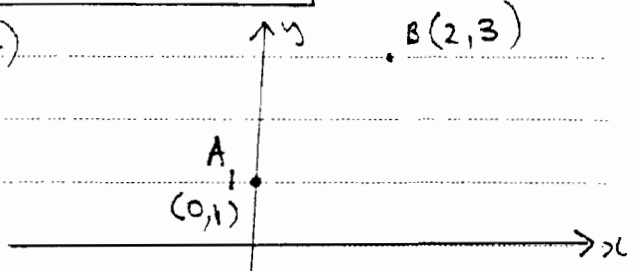
$= \frac{1-\sin\theta}{\cos\theta}$

$= \sec\theta(1-\sin\theta)$ ①

$=$ RHS

QUESTION 6

i)



i) midpt $(1, 2)$ ①

ii) $m_{AB} = \frac{3-1}{2-0} = \frac{2}{2} = 1$ ①

iii) perp bisector ① for reciprocal gradient

$y - 2 = -1(x-1)$ ① for point gradient form

$y - 2 = -x + 1$

$x + y - 3 = 0$ ①

iv) $x + y - 3 = 0$ ① } solve
$2x - y - 9 = 0$ ② } simultaneously

① + ② gives

$3x - 12 = 0$

$x = 4$ ① sub into ①

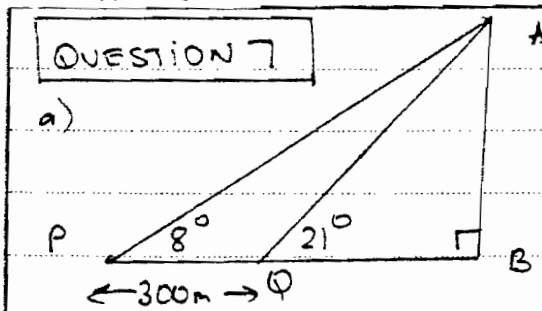
$4 + y - 3 = 0$

$y = -1$ ①

P $(4, -1)$

QUESTION 7

a)



i) $\angle PAQ = 13^\circ$ (1)

ii) $\frac{300}{\sin 13^\circ} = \frac{AQ}{\sin 8^\circ}$ (1)

$AQ = \frac{300 \sin 8^\circ}{\sin 13^\circ}$

$AQ = 185.6$ (1)

$= 186$ m (nearest m)

iii) $\sin 21^\circ = \frac{AB}{186}$ (1)

$AB = 186 \sin 21^\circ$

$AB = 67$m (1)

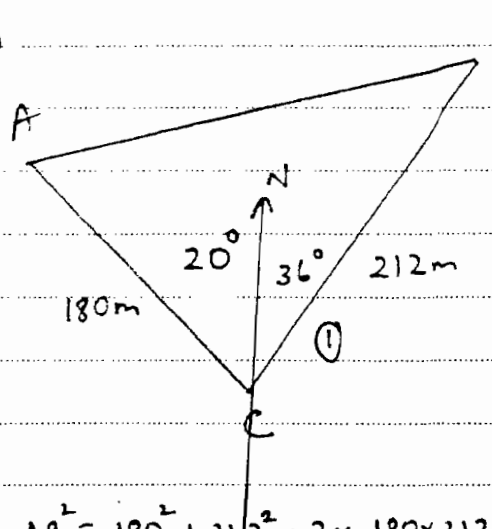
b) $\tan\theta = -\frac{1}{\sqrt{3}}$ (1)

S	A
T	C ✓

acute $\theta = 30^\circ$

$\therefore \theta = 150^\circ, 330^\circ$ (1)

c)



(1)

$AB^2 = 180^2 + 212^2 - 2 \times 180 \times 212 \times \cos 56^\circ$ (1)

$AB = 186$m (1)

QUESTION 8

a) $(3,4)$ (1) lies on $3x - 4y + 7 = 0$

$\therefore$ perp dist $(3,4)$ to

$3x - 4y - 3 = 0$ is

$P = \left| \frac{9 - 16 - 3}{\sqrt{9+16}} \right|$ (1)

$= \left| \frac{-10}{5} \right|$

$P = 2$ units (1)

b) $\operatorname{cosec} 300^\circ = \operatorname{cosec}(360 - 60)$

$= -\operatorname{cosec} 60^\circ$ (1)

$= -\frac{2}{\sqrt{3}}$ (1)