NAME _____ TEACHER _____

Sydney Technical High School

2 Unit Mathematics

Year 11

Assessment task 2 August 2009

General Instructions

- Each question attempted is to be started on a NEW PAGE, clearly marked with the number of the question, your name and class on the top right hand side of the page
- Working time allowed - 70 minutes
- Questions are of UNEQUAL value
- Write using black or blue pen
- APPROVED CALCULATORS may be used
- All necessary working should be shown. Marks may be deducted if working is poorly set out or difficult to read

Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	TOTAL
/ 8	/ 8	/ 7	/ 7	/ 7	/ 8	/ 7	/ 7	/ 59

Question 1 (8 marks)

a) Factorise fully : $2x^3 - x^2 + 8x - 4$ (2)

b) Solve $-1 < 2x + 3 \leq 5$ (2)

c) Find the domain and range of $y = \frac{1}{(2x + 3)}$ (2)

d) Show that the points A(3,2) , B(–2,1) and C(8,3) are collinear (2)

Question 2 (8 marks) (Start a new page)

a) Use the quadratic formula to solve the equation : $4x^2 + 5x - 2 = 0$
leaving your answers in the exact form (2)

b) Simplify $5\sqrt{3} + \sqrt{20} - 2\sqrt{12} + \sqrt{45}$ (2)

c) Simplify $\frac{\sin^2\theta + \cos^2\theta}{\tan^2\theta}$ (1)

d) Solve $\cos\theta = -\frac{1}{\sqrt{2}}$ for $0° \leq \theta \leq 360°$ (2)

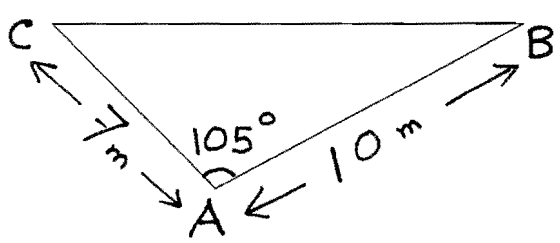
e) Is $f(x) = x^3 - x$ an odd function ? Explain your answer. (1)

Question 3 (7 marks) (Start a new page)

a) The sum of the interior angles of a regular polygon is 2340°. Find the measure of each interior angle of the polygon. (1)

b) Prove that $(1 - \tan x)^2 + (1 + \tan x)^2 = 2\sec^2 x$ (2)

c) (i) Find the length of BC to the nearest cm. (1)



(ii) Find the Area of $\triangle$ ABC (1)

(in m^2 to 2 decimal places)

d) Find the perpendicular distance from (–2, 2) to the line $6x + 3y - 1 = 0$ in the exact form (2)

Question 4 (7 Marks) (Start a new page)

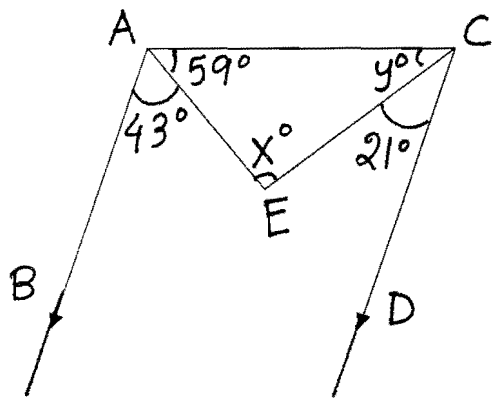
a) Find 'x' if $\sin 80° = \cos (90 - x)°$ (1)

b Draw a neat sketch of the following curve showing all relevant points

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

c) Evaluate ' x ' and ' y ' giving reasons

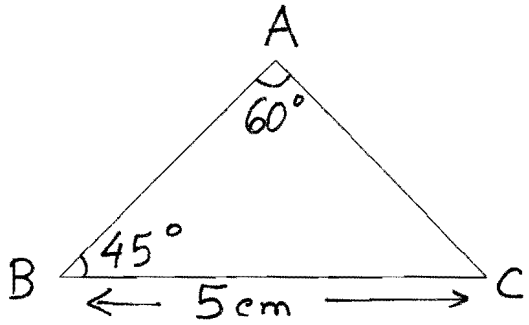
(drawing not to scale)



(4)

Question 5 (7 Marks) (Start a new page)

a) Solve $|2x + 1| = 3x - 2$ and check solutions (3)

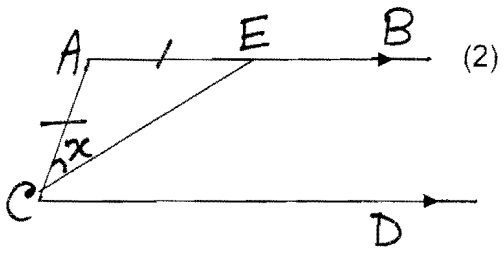
b) 

Find the exact length of AC (2)

c) Find the equation of the straight line that makes an angle of 135° with the positive x - axis and passes through the point (2,6) (2)

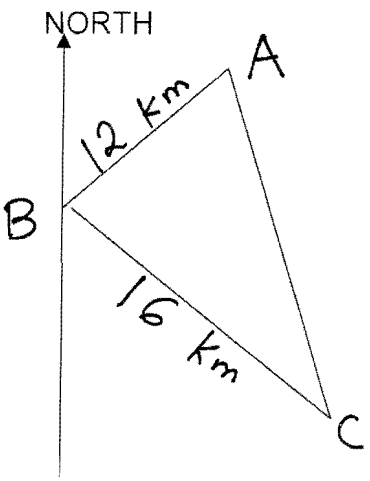
Question 6 (8 marks) **(Start a new page)**

a) AB is parallel to CD and AE = AC
Let $\angle ACE = x$
Prove that $\angle ACE = \angle ECD$



(2)

b) Two yachts sail in a straight line from a buoy B. Yacht A sails 12 km in the direction 038° T and yacht C sails 16km in the direction 128° T. Copy the diagram into your books and show all the angles given .



(drawing not to scale)

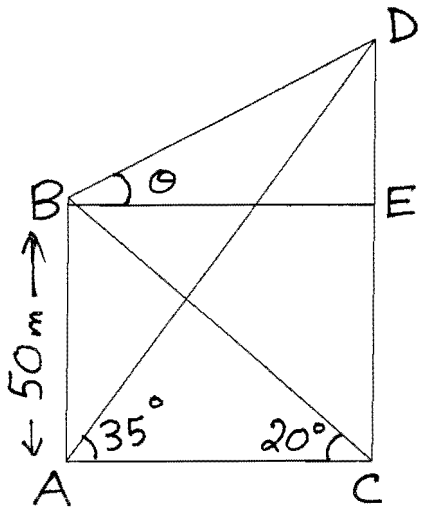
(i) How far apart are A and C ? (2)

(ii) What is the bearing of yacht A as seen from yacht C, to the nearest minute? (2)

c) Find the equation of the straight line passing through (3,7) and parallel to the line $5x - y - 2 = 0$ (2)

Question 7 (7 Marks) (Start a new page)

a) AB and CD are two vertical buildings with their bases A and C on level ground. The height of AB is 50m. The angle of elevation of B from C is 20° and angle of elevation of D from A is 35° Calculate



(i) Horizontal distance AC between the two buildings, to 1 decimal place (1)

(ii) The height of CD, to 1 decimal place (1)

(i) The angle of elevation θ of D as seen from B, to the nearest minute. (2)

b) Find the equation of the straight line with gradient of -2 that passes through the midpoint of the line joining $(5 , -2)$ and $(-3 , 4)$ (2)

c) Find the exact value of $\cos 225°$ (1)

Question 8 (7 marks) (Start a new page)

a) If $\sin x = -\frac{3}{5}$ and $\cos x > 0$, find the values of

(i) $\tan x$ (ii) $\sec x$ (2)

b) Solve : $\sqrt{3} \tan \theta = 1$ for $0° \leq \theta \leq 360°$ (2)

c) Prove that A (1,5) , B (4, –6) and C (–3, –2) are the vertices of a right angled triangle (3)

TASK 2

2UNIT MATHS YEAR 11 AUGUST 2009

Question 1

a) $2x^3 - x^2 + 8x - 4$

$x^2(2x-1) + 4(2x-1)$

$= (2x-1)(x^2+4)$

b) $-1 < 2x+3$ & $2x+3 \leq 5$

$-4 < 2x$ $\quad 2x \leq 2$

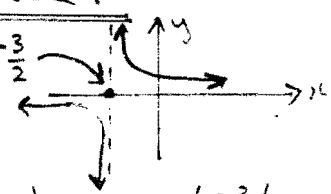
$-2 < x$ $\quad x \leq 1$

$\therefore -2 < x \leq 1$

c) If $2x+3 = 0$

$2x = -3$

$x = -3/2$



$\therefore$ Domain: all real x, $x \neq -3/2$

Range: all real y, $y \neq 0$

d) $m_{AB} = \frac{2-1}{3-2} = \frac{1}{5}$

$m_{BC} = \frac{1-3}{-2-8} = \frac{-2}{-10} = \frac{1}{5}$

since gradient equal A, B, C collinear

e) $f(x) = x^3 - x$

$f(-x) = -x^2 + x$

$-f(-x) = x^2 - x$

$\therefore f(x) = -f(-x)$ $\therefore$ odd fn

Question 2

a) $x = \frac{-5 \pm \sqrt{25 - 4 \times 4 \times -2}}{8}$

$= \frac{-5 \pm \sqrt{57}}{8}$

b) $5\sqrt{3} + \sqrt{20} - 2\sqrt{12} + \sqrt{45}$

$= 5\sqrt{3} + 2\sqrt{5} - 4\sqrt{3} + 3\sqrt{5}$

$= \sqrt{3} + 5\sqrt{5}$

c) $\frac{\sin^2\theta + \cos^2\theta}{\tan^2\theta} = \frac{1}{\tan^2\theta}$

$= \cot^2\theta$

d) $\cos\theta = -\frac{1}{\sqrt{2}}$

S	A
T	C

acute $\theta = 45°$

$\therefore \theta = 135°, 225°$

Question 3

a) int angle sum $2340°$

$(n-2) \times 180 = 2340$

$180n - 360 = 2340$

$180n = 2700$

no angles $n = 15$

$\therefore$ each interior angle $156°$

b) LHS $= (1 - \tan x)^2 + (1 + \tan x)^2$

$= 1 - 2\tan x + \tan^2 x + 1 + 2\tan x + \tan^2 x$

$= 2 + 2\tan^2 x$

$= 2(1 + \tan^2 x)$

$= 2\sec^2 x$

$=$ RHS

c) i)

$BC^2 = 7^2 + 10^2 - 2 \times 7 \times 10 \times \cos 105°$

$BC = 13.61$ m

$\therefore$ OR BC = 1361 cm

ii)

Area $= \frac{1}{2} \times 7 \times 10 \times \sin 105°$

$= 33.81$ m^2 (2 dec pl)

d) Given point: $(-2, 2)$

Given line: $6x + 3y - 1 = 0$

Perp. dist.

$d = \frac{|(6 \times -2) + (3 \times 2) - 1|}{\sqrt{6^2 + 3^2}}$

$= \frac{7\sqrt{5}}{15}$ units

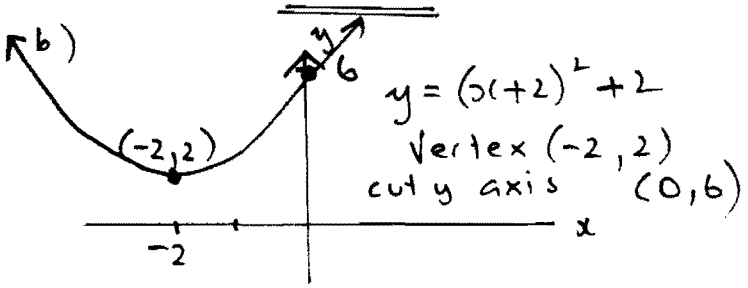
Question 4

a) $\sin 80^\circ = \cos(90-x^\circ)$

$80 + (90-x) = 90$

$\therefore x = 80^\circ$

b)



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

Vertex $(-2, 2)$

cut y axis $(0, 6)$

c)

$43 + 59 + 21 + y = 180^\circ$

(cointerior angles $AB \| CD$)

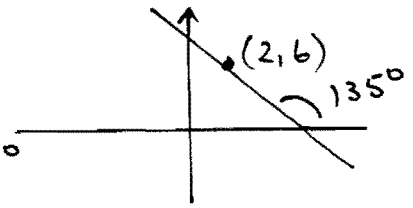
$\therefore y = 57^\circ$

$59 + x + 57 = 180^\circ$

(angle sum of $\triangle AEC$)

$x = 64^\circ$

c)



$m = \tan 135^\circ$

$m = -1$

$y - 6 = -1(x - 2)$

$y - 6 = -x + 2$

$x + y - 8 = 0$

Question 5

a) $2x + 1 = 3x - 2$ & $2x + 1 = -(3x - 2)$

$3 = x$

$2x + 1 = -3x + 2$

$5x = 1$

$x = 1/5$

check: $|6+1| = 9-2$, $|1\tfrac{2}{5}| \neq -1\tfrac{2}{5}$

$7 = 7$

true false

$\therefore x = 3$ only solution

b) $\dfrac{AC}{\sin 45^\circ} = \dfrac{5}{\sin 60^\circ}$

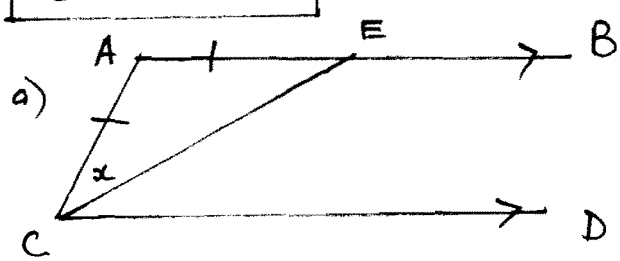
$AC = \dfrac{5 \sin 45^\circ}{\sin 60^\circ}$

$= \left(5 \cdot \dfrac{1}{\sqrt{2}}\right) \div \dfrac{\sqrt{3}}{2}$

$= \dfrac{10}{\sqrt{6}}$ cm

Question 6

a)



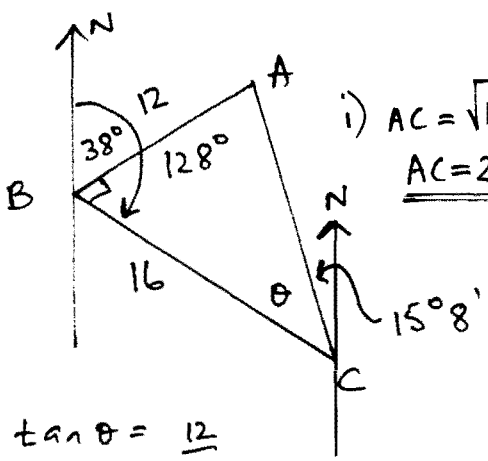
Let $A\hat{C}E = x$

$\therefore A\hat{E}C = x$ (base angles of isosceles triangle)

$E\hat{C}D = x$ (alternate angles $AB \| CD$)

$\therefore A\hat{C}E = E\hat{C}D$

b)



i) $AC = \sqrt{16^2 + 12^2}$

$AC = 20$ km

ii) $\tan\theta = \dfrac{12}{16}$

$\therefore \theta = 36^\circ 52'$

$\therefore$ Bearing $344^\circ 52'$

c) $5x - y - 2 = 0$

$y = 5x - 2 \quad m = 5 \quad (3,7)$

$y - 7 = 5(x - 3)$

$y - 7 = 5x - 15$

$0 = 5x - y - 8$

Question 7

a) $\tan 20° = \frac{50}{AC}$

i) $AC = \frac{50}{\tan 20}$

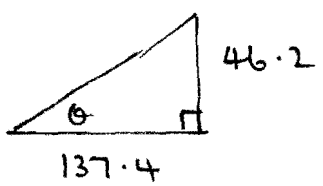
$AC = 137.4 \text{ m}$

ii) $\tan 35° = \frac{CD}{137.4}$

$CD = 137.4 \cdot \tan 35$

$CD = 96.2 \text{ m}$

iii)



$\tan \theta = \frac{46.2}{137.4}$

$\theta = 18° 35'$

b) $M(1,1) \quad m = -2$

$y - 1 = -2(x - 1)$

$y - 1 = -2x + 2$

$2x + y - 3 = 0$

c) $\cos 225°$

$= \cos(180° + 45°)$

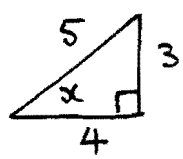
$= -\cos 45°$

$= -\frac{1}{\sqrt{2}}$

Question 8

a)

S	A ✓
✓ T	C ✓✓



i) $\tan x = -\frac{3}{4}$

ii) $\sec x = \frac{5}{4}$

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

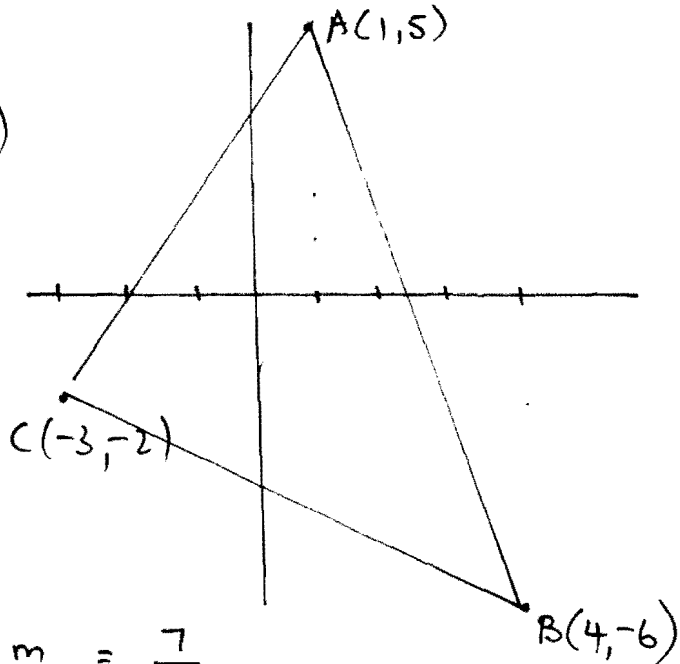
$\tan \theta = \frac{1}{\sqrt{3}}$ ✓

S	A ✓
T	C

acute $\theta = 30°$

$\therefore \theta = 30°, 210°$

c)



$m_{AC} = \frac{7}{4}$

$m_{CB} = -\frac{4}{7}$

since $m_{AC} \cdot m_{CB} = -1$

$\therefore AC \perp CB$

$A\hat{C}B = 90°$ $\triangle ABC$ is $90° \triangle$