St Catherine's School

Year: 11
Subject: Mathematics – Extension 1.
Time Allowed: 75 minutes
Date : May 2001

Student Number: _____

Directions to candidates:

- All questions are to be attempted.
- All necessary **working** must be shown in every question.
- Full marks may not be awarded for careless or badly arranged work.
- Each question attempted should be started on a **new page.**
- Write your **student number** on this cover sheet and on every sheet of paper you use.
- Approved calculators may be used.

Hand in your work in 3 bundles.

Section A Questions 1 and 2.

Section B. Questions 3 and 4.

Examination paper.

TEACHER'S USE ONLY	
Q.1	10
Q.2	10
Q.3	10
Q.4	8½
TOTAL	38½

SECTION A

Question 1

a) Sketch the following functions highlighting the main features. Also state the domain and the range for each of the following functions.

(2m)

i) $y=|x+1|$

(2m)

ii) $Y=-\sqrt{9-x^2}$

(3m)

iii) $y+1=\dfrac{1}{x-1}$

b) Sketch the following functions highlighting the main features.

i) $y=\tan x.$ $\quad 0\leq x\leq 360^0$ (1m)

i) $y=2^{-x}-1$ (2m)

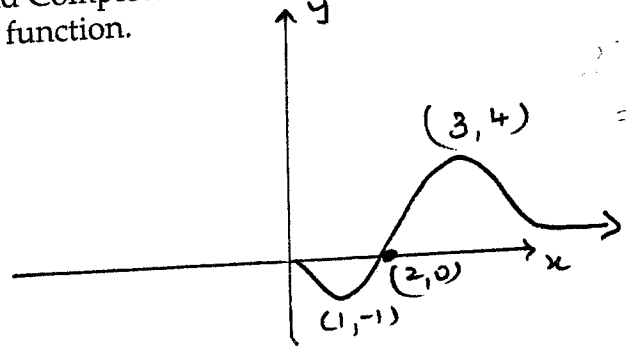
Question 2.

a) Solve for x: (i) $\dfrac{2x+1}{x+1}\geq 1$ (3m)

(ii) $x^2+2x<3$ (2m)

b) Find the equation of the line passing through (1,3) and perpendicular to $3x+4y+1=0$. (3m)

c) Copy and Complete the sketch of the following function given that it is an odd function. (2m)



SECTION B (Start a new page)

Question 3.

a) Solve for x: (2m)

(i) $\sin 2x = -\frac{1}{2} \quad 0 \le x \le 360^0$

(2m)

(ii) $\tan x = -\frac{1}{\sqrt{3}} \quad -180^0 \le x \le 180^0$

(3m)

b) Show that $\frac{\cos\theta}{1+\sin\theta} + \frac{1+\sin\theta}{\cos\theta} = \frac{2}{\cos\theta}$

(3m)

c) Show that $\sec x - \tan x - \frac{1}{\sec x - \tan x} = -2\tan x$

Question 4.

a) Solve for x: $2\cos^2 x = 1+\sin x \qquad 0 \le x \le 360^0$ (3m)

b) (i) Sketch $y=|x|$ *and* $y=x^2-2$ on the same number plane. (1m)

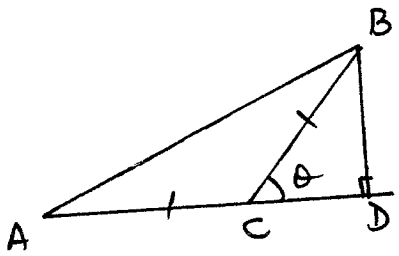
(3m)

(ii) Solve for x : $|x| = x^2 - 2$

d) ABC is an isoceles triangle where < ACB is obtuse. AC = BC= 1 cm.
BD is perpendicular to AC produced and $BD=\frac{1}{2}AD$ and <BCD is θ

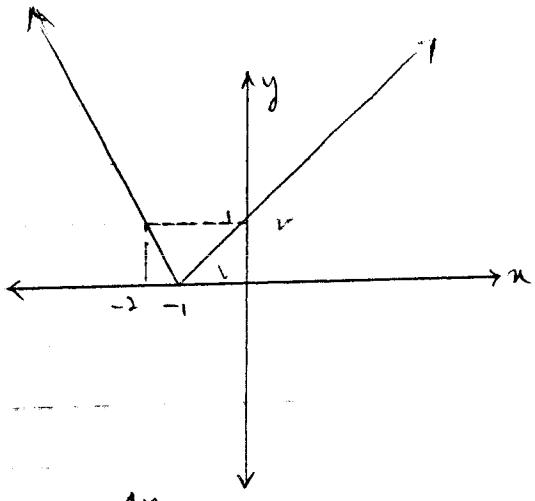
Show that $\sin\theta = \frac{1+\cos\theta}{2}$

(Hint: Find two different expressions for the area of triangle ABC) (3m)



Section A

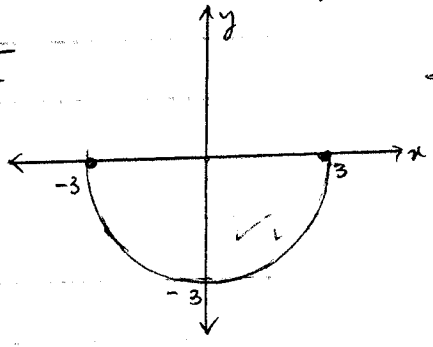
(1) A) i) $y = |x+1|$



$\Rightarrow$ D: All real x ✓

$\Rightarrow$ R: $y \geq 0$ ✓

ii) $y = -\sqrt{9-x^2}$



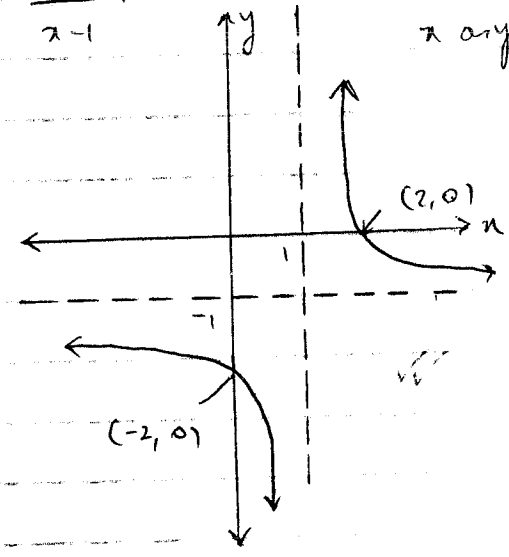
$\Rightarrow$ D: $-3 \leq x \leq 3$

$\Rightarrow$ R: $-3 \leq y \leq 0$

2

iii) $y+1 = \frac{1}{x-1}$

$y = \frac{1}{x-1} - 1$



y asymptote $\rightarrow -1$

x asymptote $\rightarrow 1$

x intercepts $\rightarrow$ make $y=0$

$0 = \frac{1}{x-1} - 1$

$\frac{1}{x-1} = 1$

$1 = x-1$

$x = 2$

y-intercept $\rightarrow$ make $x=0$.

$y = \frac{1}{-1} - 1$

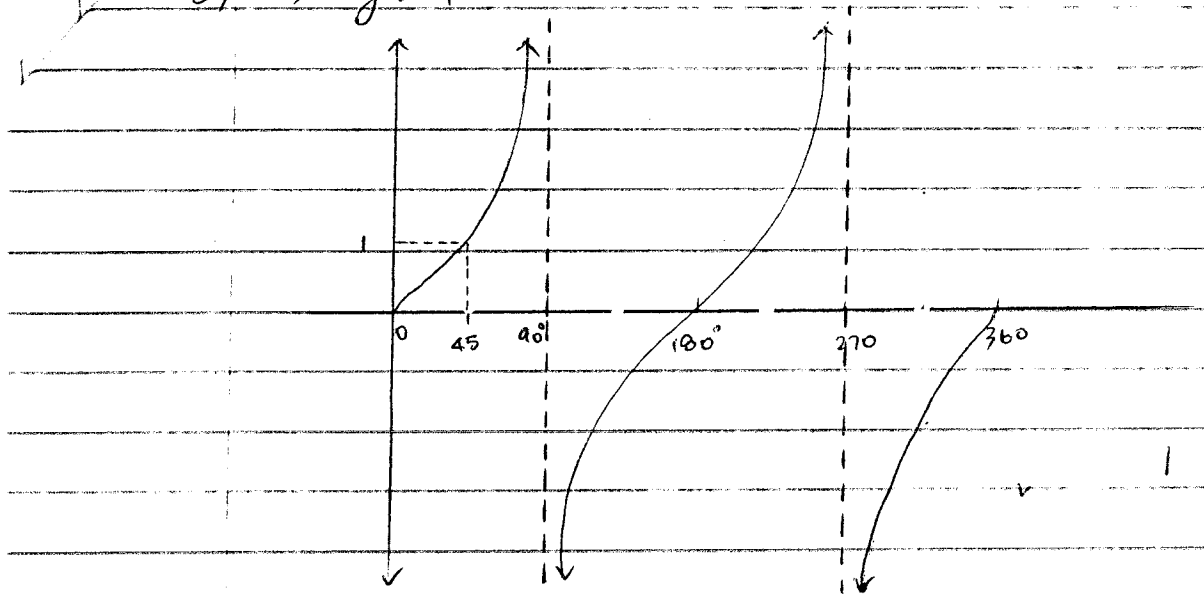
$= -2$.

$\Rightarrow$ D: $x \neq 1$

$\Rightarrow$ R: $y \neq -1$

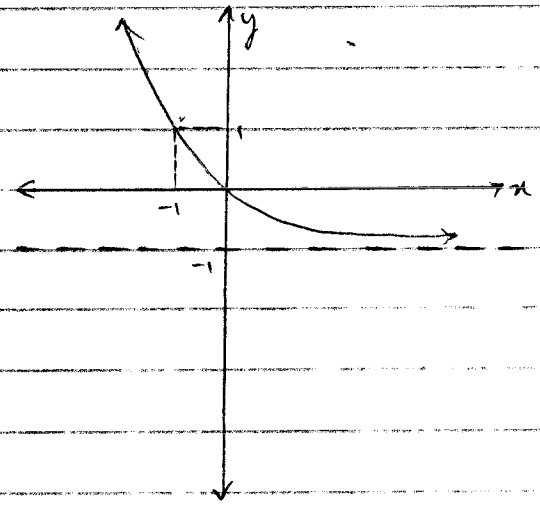
Stephanie
Sim

B) i) $y = \tan x$ $\quad 0 \leq x \leq 360$



1

ii) $y = 2^{-x} - 1$



2

Question 2 –

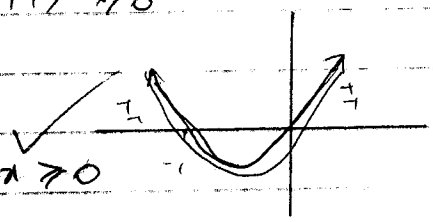
2) A) i) $\frac{2x+1}{x+1} \geq 1 \rightarrow x \neq -1$

$(2x+1)(x+1) \geq (x+1)^2$

$(2x+1)(x+1) - (x+1)(x+1) \geq 0$

$(2x+1-x-1)(x+1) \geq 0$

$x(x+1) \geq 0$ $\quad x = 0, \text{ or } -1$



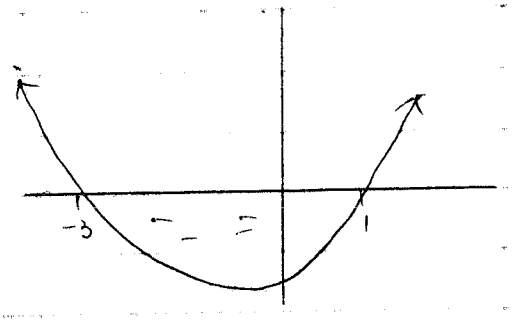
$x \leq -1$ or $x \geq 0$

ii) $x^2 + 2x < 3$

$x^2 + 2x - 3 < 0$

$(x+3)(x-1) < 0$

$-3 < x < 1$



B) $3x + 4y + 1 = 0$

$4y = -1 - 3x$

$y = -\frac{1}{4} - \frac{3}{4}x \rightarrow$ Gradient $= -\frac{3}{4}$

If the line passing through (1,3) is PERPENDICULAR to $3y + 4y +$

then the gradient $= \frac{4}{3}$ $(m \times m_1 = -1)$

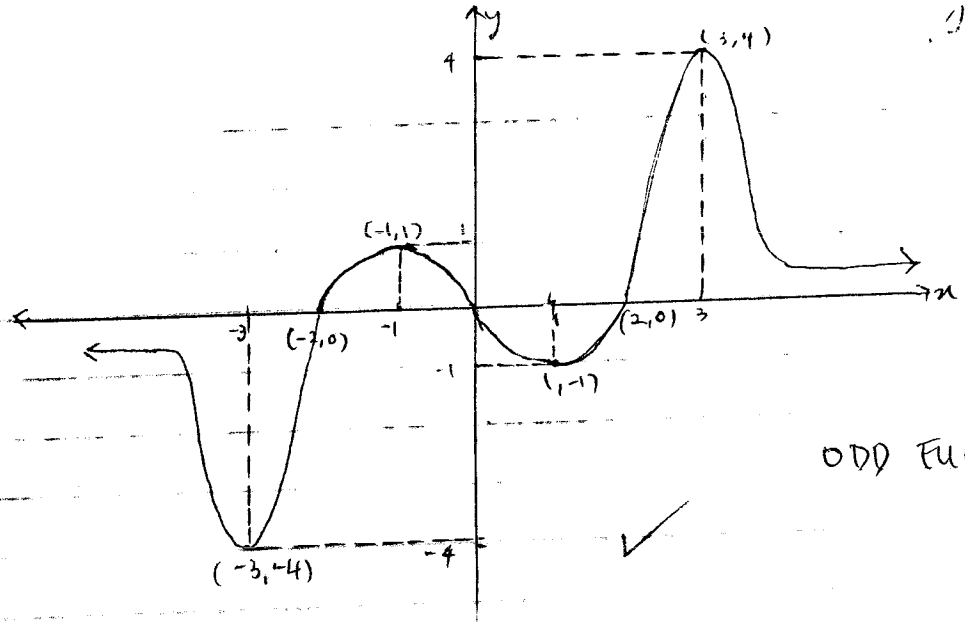
(substitute the x & y values and gradient)

$y = mx + b$

$3 = \frac{4}{3}(1) + b \rightarrow 3 = \frac{4}{3} + b$ $\quad \therefore y = \frac{4}{3}x + \frac{5}{3}$

$b = \frac{5}{3}$ $\quad \therefore 4x + 5 - 3y = 0$

(c)



ODD FUNCTION.