SYDNEY GIRLS HIGH SCHOOL

YEAR 11 MATHEMATICS EXT 1

Assessment Task 1

APRIL 2004

Time allowed: 60 minutes

Topics Geometry, Special Quadrilaterals, Functions plus harder ch 1-4

Instructions:

- There are Four(4) questions. Questions **are** of equal value.
- Attempt all questions.
- Show all necessary working. Marks may be deducted for badly arranged work.
- Start each question on a new page. Write on one side of the paper only.

Name: ....

QUESTION 2 (16 MARKS)

a) Show whether the following function is odd, even or neither.

$$f(x)=\frac{x}{x^2-1}$$

b) A function $f(x)$ is defined by

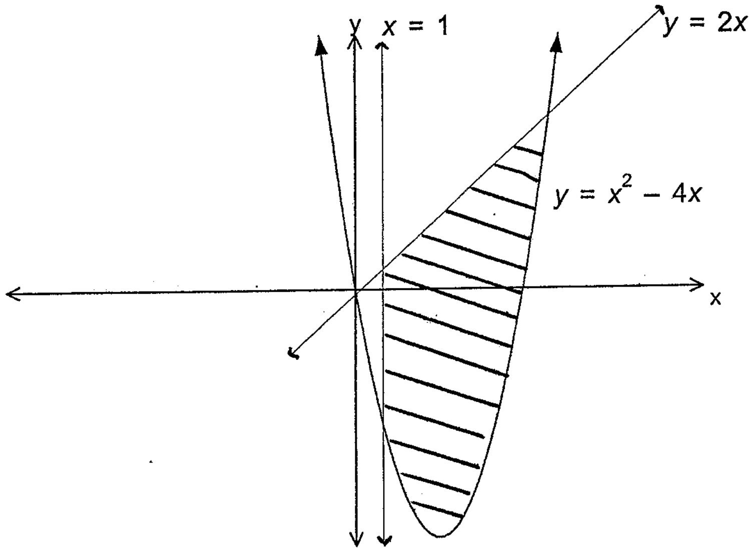
$$f(x)=\begin{cases} x^2 & \text{for} \quad -2\le x\le 1 \\ 4-3x & \text{for} \quad 1<x\le 2 \end{cases}$$

i) Sketch showing relevant points

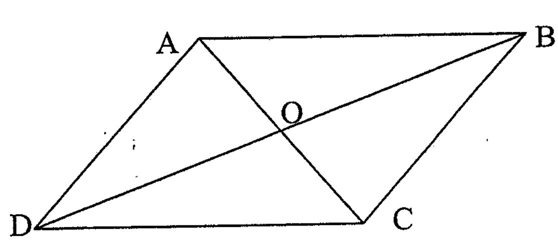
ii) Evaluate $f(-1)+f\left(1\frac{1}{2}\right)$

c) Solve the inequation $\left|\frac{3x+7}{3}\right|<4$

d) Write inequalities to represent the shaded area



e) ABCD is a rhombus. Prove that the diagonals bisect each other.



QUESTION 4 (16 MARKS)

a) Find the value of x if $9^{2x-1} = \left(\sqrt{27}\right)^{2x+4}$

b) Solve the inequality and draw the solution on the number line. $\dfrac{6}{5x-2} < 2$

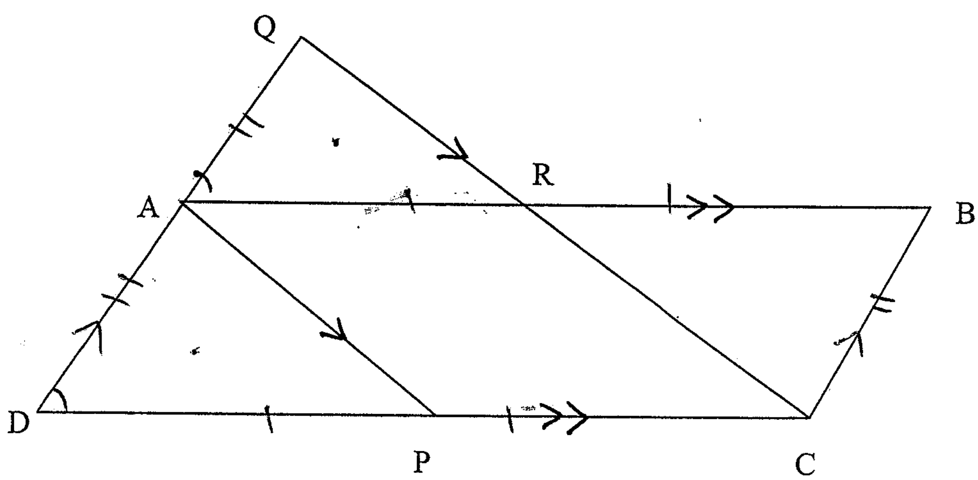
c) Simplify the following $\dfrac{|x^2-1|}{x-1}$

d) Find the exact value of $\dfrac{\frac{3}{4}+\frac{2}{3}}{1-\frac{5}{12}}$

e) ABCD is a parallelogram. P is the midpoint of DC and CQ is drawn parallel to PA meeting DA produced in Q.

i) prove $\Delta AQR \equiv \Delta ADP$

ii) hence prove AQ = BC

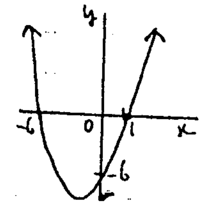


THE END

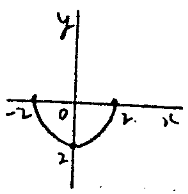
YR 11 EXT 2 APRIL 2004

Q(1)(a)

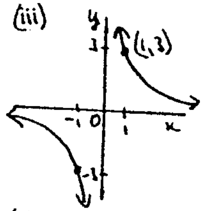
(i)



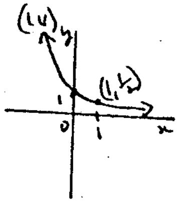
(ii)



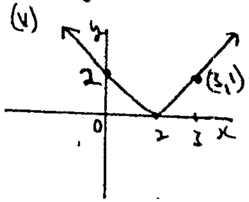
(iii)



(iv)



(v)



(10)

(b) (i) $6x = 180$
$x = 30$ (1)

(ii) $y = 60$
$x = 45°$ (2)

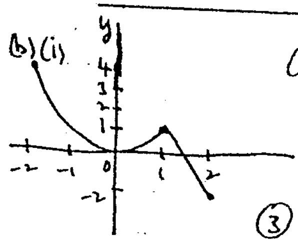
(c) $2x + 2y = 180$ (co-int ∠'s AB//DC)
$x + y = 90$
$\therefore \angle BEC + 90 = 180$ (∠ sum Δ)
$\angle BEC = 90$ (3)

Q(2)(a) $f(a) = \frac{a}{a^2-1}$ $f(-a) = \frac{-a}{a^2-1}$
$= -\left(\frac{a}{a^2-1}\right)$
$= -f(a)$

(3)

∴ ODD FUNCTION

(b)(i)



(3)

(ii) $f(-1) = (-1)^2 = 1$
$f(1\frac{1}{2}) = 4 - 3(1\frac{1}{2})$
$= -\frac{1}{2}$
$1 - \frac{1}{2} = \frac{1}{2}$

(c) $-4 < \frac{3x+7}{3} < 4$
$-12 < 3x+7 < 12$
$-19 < 3x < 5$
$-6\frac{1}{3} < x < \frac{5}{3}$ (3)

(d) $y \le 2x$
$y \ge x^2 - 4x$
$x \ge 1$ (3)

(e) IN ΔAOB AND ΔDOC
AB = DC (SIDES IN A RHOMBUS)
∠BAC = ∠DOC (ALT ∠'s AB//DC)
∠ABD = ∠ODC (" ")
∴ ΔAOB ≡ ΔDOC (AAS)
∴ AO = CO (corres sides ≡ Δ's)
BO = DO " " "

(4)

Q(3)(a)(i) D; $x \ne \frac{3}{2}$
R; $y \in R$ (2)

(ii) D; $x \le 5$
R; $y \ge 0$ (2)

(iii) D; $x \in R$
R; $y \ge 0$ (2)

(b) $x^2 + 6x = -4$
$(x+3)^2 = -4 + 9$
$x + 3 = \pm\sqrt{5}$
$x = -3 \pm \sqrt{5}$ (2)

(c) $AD^2 = r^2 + r^2$
$= 2r^2$
$AD = \sqrt{2}.r$

$A = \pi r^2 - (\sqrt{2}.r)^2$
$= \pi r^2 - 2r^2$
$= r^2(\pi - 2)$ (2)

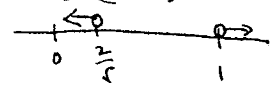
(d) (i) $\angle = \frac{(N-2)180}{N}$
$= \frac{8 \times 180}{10}$
$= 144°$ (2)

(ii) $180 - 160$
$= 20$
$N = \frac{360}{20}$
$= 18$ (2)

(e) $\frac{AX}{3} = \frac{8}{4}$
$AX = 6$
LET $ZX = M$ ∴ $AZ = 6 - M$
$\frac{6-M}{M} = \frac{8}{4}$
$24 - 4M = 8M$
$M = 2$
ie; $ZX = 2$ (2)

Q(4) (a) $(3^2)^{2x-1} = (3^3)^{\frac{1}{2}(2x+4)}$
$3^{4x-2} = 3^{3x+6}$
$4x - 2 = 3x + 6$
$x = 8$ (3)

(b) $6(5x-2) < 2(5x-2)^2$
$6(5x-2) - 2(5x-2)^2 < 0$
$2(5x-2)[3-(5x-2)] < 0$
$2(5x-2)(-5x+5) < 0$
$10(5x-2)(1-x) < 0$



(4)

TEST $x = 0$ $10(-2)(1) < 0$ ∴ T

(c) $\frac{x^2-1}{x-1} = \frac{(x-1)(x+1)}{(x-1)} = x+1$

OR

$\frac{-(x^2-1)}{x-1} = \frac{(1-x)(1+x)}{(x-1)} = -(x+1)$
$= -x-1$ (2)

(d) $2^{\frac{3}{7}}$ (1)

(e)(i) ARCP IS A //ogram (2 pairs of opp. sides //)
AR = PC (opp sides //ogram)
DP = PC (GIVEN)
∴ AR = DP
∠OAR = ∠AOP (corres ∠'s AR//DP)
∠DAP = ∠AQR (" " QR//AP)
∴ ΔAQR ≡ ΔADP (AAS) (4)
∴

(ii) AQ = AD (corres sides ≡ Δ's)
AD = BC (opp. sides //ogram)
∴ AQ = BC (2)