SYDNEY TECHNICAL HIGH SCHOOL

YEAR 11 MATHEMATICS

MAY 2004

Time allowed: 70 minutes

Instructions:

- Start each question on a new page
- Board approved calculators may be used
- All necessary working should be shown
- Marks indicated are approximate only
- Marks may not be awarded for messy or poorly arranged work
- *When sketching, use a ruler to draw the axes. Your sketch must be neat and clearly labelled.*

Name:_____ Class:_____

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Total
/8	/8	/8	/8	/8	/8	/8	/8	64

Question 1

a) Express 54 808 correct to 2 significant figures (1)

b) Express 0.000532 in scientific notation (1)

c) Simplify $\sqrt{\frac{a^2b^6}{a^6b^4}}$ (2)

d) Express $0.\dot{2}\dot{1}$ as a fraction in simplest form (2)

e) The area of a trapezium is given by $A = \frac{h}{2}(a+b)$ (2)

Find the value of a given $A = 624$, $h = 26$ and $b = 18$

Question 2

a) Expand and simplify $(a+b)(a-b) - a(a-2b)$ (2)

b) Simplify $\frac{x-1}{2} + \frac{x-3}{3}$ (2)

c) Solve $|1-2x| = 5$ (2)

d) Simplify $(2\sqrt{5})^3$ (2)

Question 3

a) Factorise fully

i) $6x^2 - 7x - 3$ (2)

ii) $x^4 - 16$ (2)

iii) $z^3 - z^2 + z - 1$ (2)

iv) $y^3 - 8$ (2)

Question 4

a) Simplify $\frac{3x - x^2}{9 - x^2}$ (2)

b) Solve simultaneously for x and y (3)

$3x - 2y = 29$

$4x + 5y = 8$

c) Express $\frac{2}{2 - \sqrt{3}}$ in the form $a + \sqrt{b}$ where a and b are rational (3)

Question 5

a) Solve $\frac{x - 3}{2} - \frac{4 - 2x}{3} = 1$ (3)

b) Consider the function $y = \sqrt{10 - x}$

i) Explain why the domain of this function is restricted. (1)

ii) Hence state the natural domain of $y = \sqrt{10 - x}$ (1)

c) How many points of intersection have the graphs of $x^2 + y^2 = 4$ *and* $y = x^2 + 4$? (3)

Justify your answer graphically.

Question 6

a) Sketch the following functions. Label any important points.

i) $y = \sqrt{9 - x^2}$ (1)

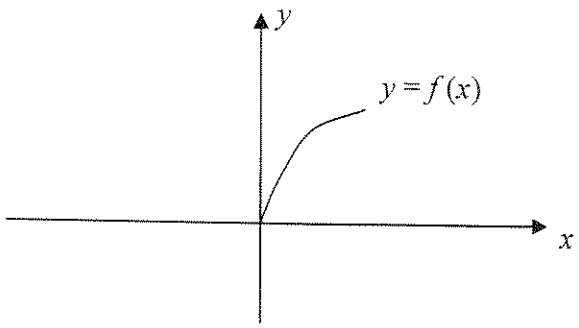
ii) $y = x^2 + 4x - 5$ (2)

b) Solve $|2x + 1| = 3x - 2$ (3)

c) Factorise $9 - (x + y)^2$ (2)

Question 7

a) The diagram shows part of a function $y = f(x)$ (1)



i) Copy the diagram onto your answer sheet

ii) Complete the graph of $y = f(x)$ given that it is an odd function.

b) Find the exact solutions of $x(2x+1) = 2$ (3)

c) i) On the same number plane, graph $y = |x-1|$ *and* $y = |x+2|$ (2)

ii) Hence or otherwise solve $|x-1| = |x+2|$ (2)

Question 8

a) For what value/s of x is $x \times x < x + x$? (2)

b) Consider the function $y = 1 + \frac{1}{x}$

i) For what value of x is the function undefined? (1)

ii) Find the x intercept (1)

iii) What is the equation of the horizontal asymptote (1)

iv) Hence sketch the curve (3)

End of Paper

YEAR 11 MATHEMATICS MAY 2004

Question 1

a) $55\,000$ or 5.5×10^4

b) 5.32×10^{-4}

c) $\sqrt{\frac{b^2}{a^4}} = \frac{b}{a^2}$

d) let $x = 0.\dot{2}\dot{1}$

$100x = 21.21....$

$99x = 21$

$\therefore 0.\dot{2}\dot{1} = \frac{7}{33}$

e) $A = \frac{h}{2}(a+b)$

$624 = \frac{26}{2}(a+18)$

$48 = a + 18$

$a = 30$

Question 2

a) $a^2 - b^2 - a^2 + 2ab$

$= 2ab - b^2$

b) $\frac{3x-3}{6} + \frac{2x-6}{6}$

$= \frac{5x-9}{6}$

c) $1 - 2x = 5$ or $1 - 2x = -5$

$2x = -4$ $\quad$ $2x = 6$

$\therefore$ $x = -2$ $\quad$ $x = 3$

d) $2\sqrt{5} \times 2\sqrt{5} \times 2\sqrt{5} = 8 \times 5\sqrt{5}$

$= 40\sqrt{5}$

Question 3

a) i. $(3x+1)(2x-3)$

ii. $(x^2-4)(x^2+4)$

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

iii. $z^2(z-1) + (z-1)$

$= (z-1)(z^2+1)$

iv. $(y-2)(y^2+2y+4)$

Question 4

a) $\frac{x(3-x)}{(3+x)(3-x)} = \frac{x}{3+x}$

b) $3x - 2y = 29$ ①

$4x + 5y = 8$ ②

① × 4 : $12x - 8y = 116$ ③

② × 3 : $12x + 15y = 24$ ④

④ − ③

$23y = -92$

$y = -4$

$3x - 2x - 4 = 29$

$3x = 21$

$x = 7$

$\therefore x = 7,\ y = -4$

c) $\frac{2}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$

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

$= 4 + 2\sqrt{3}$

$= 4 + \sqrt{12}$

Question 5

a) $^{6}\times\frac{x-3}{2} \; -^{6}\times\frac{4-2x}{3} = 1\times 6$

$3(x-3) - 2(4-2x) = 6$

$3x - 9 - 8 + 4x = 6$

$7x = 23$

$\therefore \; x = \frac{23}{7}$

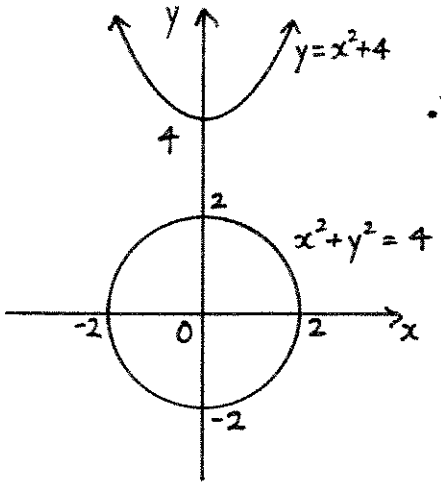
b) i. we can't evaluate the square root of a negative number

ii. $10 - x \geqslant 0$

$10 \geqslant x$

$x \leqslant 10$

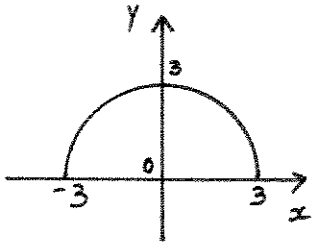
c)



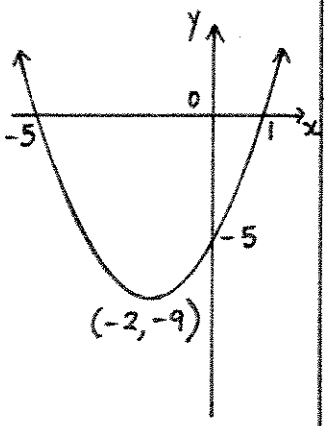
$\therefore$ no points of inters.

Question 6

a) i.



ii.



b) $2x+1 = 3x-2$ or $2x+1 = 2-3x$

$3 = x$ ✓ $\qquad 5x = 1$

$x = \frac{1}{5}$ ×

Check solutions!

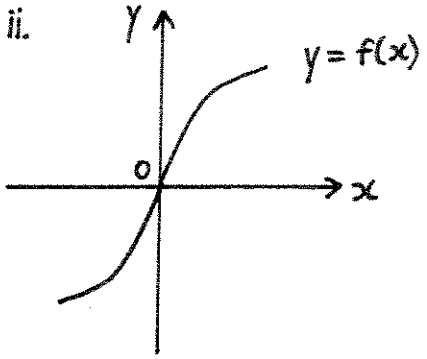
$\therefore \; \underline{x = 3}$ only

c) $[3+(x+y)][3-(x+y)]$

$= \underline{(3+x+y)(3-x-y)}$

Question 7

a) ii.



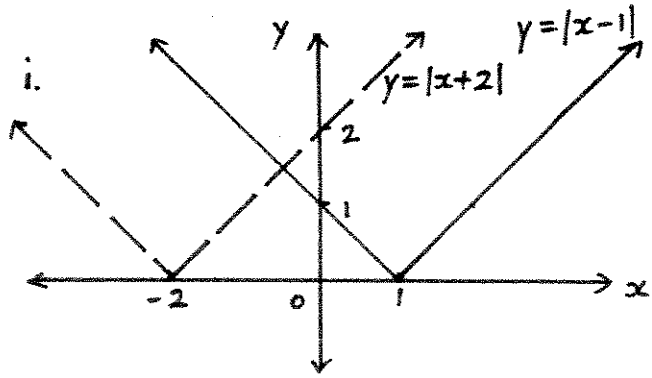
b) $2x^2 + x = 2$

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

$x = \frac{-1 \pm \sqrt{1^2 - 4.2.-2}}{2.2}$

$\therefore \; x = \frac{-1 \pm \sqrt{17}}{4}$

c) i.



ii. $x = -\frac{1}{2}$

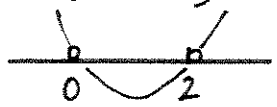
Question 8

a) $x \times x < x + x$

$x^2 < 2x$

$x^2 - 2x < 0$

$x(x-2) < 0$



$\therefore \quad \underline{0 < x < 2}$

b) $y = 1 + \frac{1}{x}$

i. $\underline{x = 0}$

ii. let $y = 0$

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

$\underline{x = -1}$

iii. $\underline{y = 1}$

iv.