Name: ..... Maths Class: .....

Sydney Technical High School

2 Unit Mathematics

Year 11

Assessment Task 1 April 2002

Instructions:

- Write your name and class at the top of this page.
- Attempt all questions. All questions are of equal value.
- Staple these questions to the front of your answers.
- Begin each question on a new page.
- All working must be shown.

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	TOTAL
6	6	7	7	7	7	7	6	53

Question 1

1 (a) Write 6¼ %. as a fraction in simplest terms.

1 (b) Decrease \$2000 by 8½%.

1 (c) Write 0·000 004 173 in scientific notation.

1 (d) Calculate $(8{\cdot}3\times10^{15})-(7{\cdot}1\times10^{13})$ (leave your answer in scientific notation correct to 2 significant figures).

1 (e) Evaluate $|-6|\times|3-5|$

2 (f) Solve $\frac{2x}{3}=2+\frac{x-3}{2}$

Question 2 (Begin a new page)

1 (a) Simplify $3x^3 - 2x^2 - 4x(2 - 3x + x^2)$

1 (b) If $\frac{1}{\sqrt[4]{x}} = x^p$, what is the value of p?

1 (c) Simplify fully $\frac{y^4}{(y^2)^{-2}}$

1 (d) Solve for integer x: $\sqrt{26} < x < \sqrt{48}$

2 (e) Express with a rational denominator $\frac{3-\sqrt{2}}{1+\sqrt{2}}$

1 (f) Solve $1 - 2x < 5$

Question 3 (Begin a new page)

1 (a) Simplify fully $\sqrt{72} \times \sqrt{20}$

2 (b) Find the values of a and b if $a + \sqrt{b} = 4 + 2\sqrt{6}$.

1 (c) Simplify $\frac{a}{4} \div \frac{a}{2}$

1 (d) Evaluate $\frac{3a}{a+1}$ if $a = \frac{4}{5}$

2 (e) Solve $(x - 3)^2 = 5$ leaving your answer as a surd.

Question 4 (Begin a new page)

3 (a) Express $0\cdot4\dot{5}$ as a simple fraction.

4 (b) Find the points of intersection of the curves $x - y = 5$ and $y = x^2 - 11$.

Question 5 (Begin a new page)

3 (a) Solve $x(2x-1)=1$

2 (b) Solve $4^{x+3}=32$

2 (c) Solve $|3x-4|<8$

Question 6 (Begin a new page)

2 (a) The function $f(x)=\begin{cases} x^3+1 & \text{if } x>2 \\ 2x & \text{if } -1\le x\le 2 \\ 5 & \text{if } x<-1 \end{cases}$

Find $f(-2)+f(2)$

2 (b) (i) State why it is necessary to restrict the domain of the function $y=\dfrac{1}{x-3}$

(ii) Hence state the domain of the function $y=\dfrac{1}{x-3}$

3 (c) Solve $|x-4|=5-2x$

Question 7 (Begin a new page)

1 (a) Factorise t^3+8

3 (b) (i) Neatly sketch the graph of $y=2x(6-x)$. (Make your diagram at least 8cm x 8cm and use a ruler.)

(ii) Hence state the range for the function $y=2x(6-x)$

3 (c) Simplify $\dfrac{1}{x+y}+\dfrac{2y}{x^2-y^2}$

Question 8 (Begin a new page)

1 (a) Simplify $f(x)+f(-x)$ if $f(x)$ is an even function.

2 (b) Determine if the following function is odd, even or neither:

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

2 (c) Factorise $x^2+2ax+a^2-y^2$

2 (d) (i) Expand $\left(x+\frac{1}{x}\right)^2$ =

(ii) If $x+\frac{1}{x}=4$, find the value of $x^2+\frac{1}{x^2}$ without solving for x.

End of Exam

YEAR 11 2U ASSESSMENT 1 MAY 2002 - SOLUTIONS

QUESTION 1.

MARKS

a) $6\frac{1}{4}\% = \frac{1}{16}$ — 1

b) \$1830 — 1

c) 4.173×10^{-6} — 1

d) 8.2×10^{15} — 1

e) 12 — 1

f) $\frac{2x}{3} = 2 + \frac{x-3}{2}$

$4x = 12 + 3x - 9$ — 1

$x = 3$ — 1

QUESTION 2.

a) $3x^3 - 2x^2 - 8x + 12x^2 - 4x^3$

$= -8x + 10x^2 - x^3$ — 1

$p = -\frac{1}{4}$ — 1

b) y^8 — 1

c) $x = 6$ — 1

d) $\frac{3-\sqrt{2}}{1+\sqrt{2}} \times \frac{1-\sqrt{2}}{1-\sqrt{2}} = \frac{3-3\sqrt{2}-\sqrt{2}+2}{1-2}$

$= 4\sqrt{2} - 5$ — 2

e) $1 - 2x < 5$

$2x > -4$

$x > -2$ — 1

QUESTION 3.

a) $\sqrt{72} \times \sqrt{20} = 6\sqrt{2} \times 2\sqrt{5}$

$= 12\sqrt{10}$ — 1

b) $a = 4, \; b = 24$ — 2

c) $\frac{a}{4} \times \frac{2}{a} = \frac{2}{4} = \frac{1}{2}$ — 1

d) $\frac{3 \times \frac{4}{5}}{\frac{4}{5} + 1} = \frac{3 \times 4}{4 + 5} = \frac{12}{9}$

$= \frac{4}{3}$ — 1

e) $x - 3 = \pm\sqrt{5}$ — 1

$x = 3 \pm \sqrt{5}$ — 1

QUESTION 4.

MARK

a) Let $x = 0.4\dot{5}$

$100x = 45.\dot{5}$ — 1

$10x = 4.\dot{5}$ — 1

$\therefore 90x = 41$

$\therefore 0.4\dot{5} = \frac{41}{90}$ — 1

b) $x - y = 5$ ——— (A)

$y = x^2 - 11$ ——— (B)

(B) → (A): $x - (x^2 - 11) = 5$ — 1

ie $x^2 - x - 6 = 0$ — 1

$(x-3)(x+2) = 0$

$\therefore x = 3, -2$ — 1

$\therefore y = -2, -7$

Pts of intersection: $(3,-2), (-2,-7)$

QUESTION 5.

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

$2x^2 - x - 1 = 0$ — 1

$(2x+1)(x-1) = 0$ — 1

$\therefore x = -\frac{1}{2}, 1$ — 1

(b) $4^{x+3} = 2^5$

$2^{2x+6} = 2^5$ — 1

$2x + 6 = 5$

$2x = -1$

$x = -\frac{1}{2}$ — 1

(c) $3x - 4 < 8$ OR $-3x + 4 < 8$

$3x < 12$ | $3x - 4 > -8$

$x < 4$ | $3x > -4$

$x > -\frac{4}{3}$ — 1

QUESTION 6

MARKS

(a) $f(-2) + f(2)$

$= 5 + 4$ 1+1

$= 9$

b) (i) Denominator cannot be zero. 1

(ii) Domain: All real x except 3. 1

(All x, $x \neq 3$)

c) $|x-4| = 5-2x$

$x-4 = 5-2x$ or $-(x-4) = 5-2x$

$3x = 9$ $x = 1$ (1)

$x = 3$ (1)

But $x \neq 3$ since when $x=3$, RHS < 0.

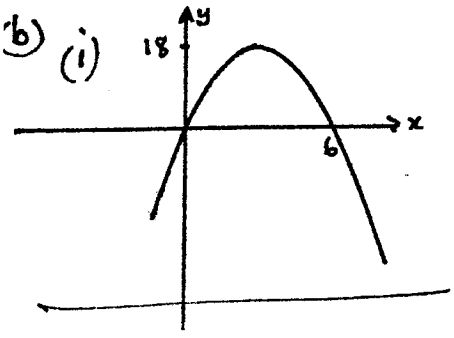
$\therefore x = 1$ (1)

QUESTION 7

(a) $t^3 + 8$

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

(b) (i)



1 for shape

1 for x intercepts

(ii) Range: $\{y \mid y \leq 18\}$ 1

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

$\frac{x-y}{x^2-y^2} + \frac{2y}{x^2-y^2}$ 1

$\frac{x+y}{x^2-y^2}$ 1

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

QUESTION 8

MARKS

(a) $f(x) + f(-x)$

$= f(x) + f(x)$ since $f(x)$ even

$= 2f(x)$ 1

(b) $f(x) = \frac{x^3+x}{x^3-x}$ $= \frac{x(x^2+1)}{x(x^2-1)}$

Now $f(-x) = \frac{(-x)^3+(-x)}{(-x)^3-(-x)}$ $= \frac{(-x)^2+1}{(-x)^2-1}$ 1

$= \frac{-x^3-x}{-x^3+x}$ $= \frac{x^2+1}{x^2-1}$

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

$= \frac{x^3+x}{x^3-x}$

$= f(x)$

$\therefore f(x)$ is even. $\therefore f(x)$ even. 1

(c) $x^2 + 2ax + a^2 - y^2$

$= (x+a)^2 - y^2$ 1

$= (x+a+y)(x+a-y)$ 1

(d) (i) $\left(x + \frac{1}{x}\right)^2 = x^2 + 2x \cdot \frac{1}{x} + \frac{1}{x^2}$

$= x^2 + \frac{1}{x^2} + 2$ 1

(ii) $x^2 + \frac{1}{x^2} + 2 = (4)^2$

$\therefore x^2 + \frac{1}{x^2} = 16 - 2 = 14.$ 1