

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

Question 1

- 1 (a) Write $6\frac{1}{4}\%$ as a fraction in simplest terms.
- 1 (b) Decrease \$2000 by $8\frac{1}{2}\%$.
- 1 (c) Write 0.000 004 173 in scientific notation.
- 1 (d) Calculate $(8.3 \times 10^{15}) - (7.1 \times 10^{13})$ (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 $0.4\dot{5}$ 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 $f(x) = \begin{cases} x^3 + 1 & \text{if } x > 2 \\ 2x & \text{if } -1 \leq x \leq 2 \\ 5 & \text{if } x < -1 \end{cases}$

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

- 2 (b) (i) State why it is necessary to restrict the domain of the function $y = \frac{1}{x-3}$
- (ii) Hence state the domain of the function $y = \frac{1}{x-3}$
- 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 $\frac{1}{x+y} + \frac{2y}{x^2 - y^2}$

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

QUESTION 1. MARKS

- a) $6\frac{1}{4}\% = \frac{1}{16}$ 1
- b) \$1830 1
- c) $4 \cdot 173 \times 10^{-6}$ 1
- d) $8 \cdot 2 \times 10^{15}$ 1
- e) 12 1
- f) $\frac{2x}{3} = 2 + \frac{x-3}{2}$ 1
 $4x = 12 + 3x - 9$
 $x = 3$

QUESTION 2.

- a) $3x^3 - 2x^2 - 8x + 12x^2 - 4x^3$ 1
 $= -8x + 10x^2 - x^3$
- b) $p = -\frac{1}{4}$ 1
- c) y^8 1
- d) $x = 6$ 1
- e) $\frac{3-\sqrt{2}}{1+\sqrt{2}} \times \frac{1-\sqrt{2}}{1-\sqrt{2}} = \frac{3-3\sqrt{2}-\sqrt{2}+2}{1-2}$ 2
 $= 4\sqrt{2} - 5$
- f) $1 - 2x < 5$ 1
 $2x > -4$
 $x > -2$

QUESTION 3.

- a) $\sqrt{72} \times \sqrt{20} = 6\sqrt{2} \times 2\sqrt{5}$ 1
 $= 12\sqrt{10}$
- b) $a = 4, b = 24$ 2
- c) $\frac{a}{4} \times \frac{2}{a} = \frac{2}{4} = \frac{1}{2}$ 1
- d) $\frac{3 \times \frac{4}{3}}{\frac{4}{5} + 1} = \frac{3 \times 4}{4 + 5} = \frac{12}{9}$ 1
 $= \frac{4}{3}$
- e) $x - 2 - + \sqrt{E}$ 1

QUESTION 4. MARKS

- a) Let $x = 0.4\dot{5}$ 1
 $100x = 45.\dot{5}$ 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)
 $(B) \rightarrow (A): x - (x^2 - 11) = 5$ 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: $(3, -2), (-2, -7)$ 1

QUESTION 5.

- (a) $x(2x-1) = 1$ 1
 $2x^2 - x - 1 = 0$ 1
 $(2x+1)(x-1) = 0$ 1
 $\therefore x = -\frac{1}{2}, 1$ 1
- (b) $4^{x+3} = 2^5$ 1
 $2^{2x+6} = 2^5$ 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) $f(-2) + f(2)$

$= 5 + 4$

$= 9$

1+1

(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

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

$\therefore x = 1$

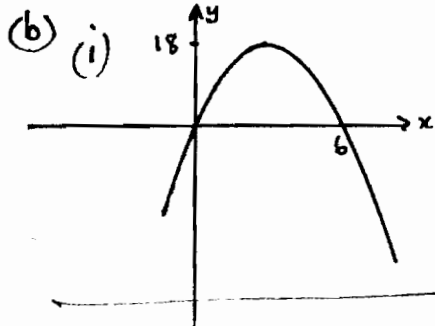
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QUESTION 7

(a) $t^3 + 8$

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

1



1 for shape

1 for x intercepts

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

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

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

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

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

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

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

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

$= f(x)$

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

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

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

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

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

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

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

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

YEAR 11 2 UNIT ASSESSMENT MAY 2002
MARKING SCHEME

ANSWER	MARK		PART MARK
Q1 (a) $\frac{1}{16}$ b) \$1830 c) 4.173×10^{-6} d) 8.2×10^{15} e) 12 f) $x = 3$	1 1 1 1 1 2	OR Correctly removes fractions	1
Q2 a) $-x^3 + 10x^2 - 8x$ b) $-\frac{1}{4}$ c) y^8 d) 6 e) $4\sqrt{2} - 5$ f) $x > -2$	1 1 1 1 2 1	OR knows to multiply by $\frac{1-\sqrt{2}}{1+\sqrt{2}}$	1
Q3 a) $12\sqrt{10}$ b) $a=4, b=24$ c) $\frac{1}{2}$ d) $\frac{4}{3}$ e) $3 \pm \sqrt{5}$	1 2 1 1 2	1 mark each OR for attempting to take $\sqrt{\quad}$ of both sides	1
Q4 a) $4\frac{1}{90}$ b) $(3, -2)$ and $(-2, -7)$	3 4	OR Removing fractional part by subtraction OR Knowing to $\times 100$ or $\times 10$ OR Finding correct x values OR Obtaining a correct equation in 1 variable OR Making a correct substitution	2 1 3 2 1

Y11 20 MAY 2002 - MARKING SCHEME

ANSWERS	MARK		PART MARK
Q5 a) $-k, 1$ b) $-\frac{1}{2}$ c) $-\frac{4}{3} < x < 4$ or $x > -\frac{4}{3}, x < 4$ (no need to combine)	3 2 2	OR Obtaining quadratic in standard form & Correctly factorizing quadratic OR Making bases the same 1 mark each part OR if both answers wrong but a correct inequality was obtained for the negative case of the absolute value	1 +1 1 1
Q6 a) 9 b) i) Denominator $\neq 0$ ii) Domain $\{x: x \neq 3\}$ c) $x = 1$ and $x = 3$. Testing solution: to eliminate $x = 3$.	2 1 1 1 1 1	OR either $f(-2)$ or $f(2)$ correct	1
Q7 a) $(t+2)(t^2-2t+4)$ b) i) Correct shape \cap Correct x intercepts ii) Range $\{y: y \leq 18\}$ c) $\frac{1}{x-y}$	1 1 1 1 3	OR $\frac{x+y}{x^2-y^2}$ OR For correctly changing denominators to x^2-y^2	2 1
Q8 a) $2f(x)$ b) $f(x)$ is even c) $(x+a+y)(x+a-y)$ d) i) $x^2 + 2 + \frac{1}{x^2}$ ii) 14	1 2 2 1 1	OR Knowing to find $f(-x)$ OR $(x+a)^2 - y^2$	1 1