



Waverley College
Year 11 2 Unit Mathematics Examination
Term 2
16 May 2002

TIME ALLOWED: 40 MINUTES

NAME:

TEACHER:

INSTRUCTIONS:

Attempt all questions

Start each question in a new booklet

Calculators may be used

Write in blue or black pen only

Show all necessary working

Marks may be deducted for careless or badly arranged work

QUESTION 1	12 /22
QUESTION 2	11 /22
TOTAL	23 /44
	52 %

Outcomes –P1, P2, P3, P4 and P5

QUESTION 1 (22 marks)

- a) Solve the equation $3x^2 - 6x + 1 = 0$ giving each solution to two decimal places. | (2 marks)
- b) Mark on a number line the values of x for which $|x - 2| < 3$ | (2 marks)
- c) Solve the pair of simultaneous equations: | (2 marks)

$$2x + y = 7$$

$$x - 2y = 1$$

- d) Graph the solution of $4x \leq 15 \leq -9x$ 0 (2 marks)
- e) Indicate which of the following are functions or relations: 4 (5 marks)
- i) $y = x^2 + 2x - 3$
- ii) (1,2), (3,4), (5,12), (7,4)
- iii) $x^2 + (y - 2)^2 = 5$
- iv) $y = \sqrt{25 - x^2}$
- v) (2,1), (3,1), (4,5), (2,3)
- f) Draw sketches of the following functions and state the domain and range of each.

i) $y = |x| - 1$ 2 (3 marks)

ii) $y = \frac{2}{x - 4}$ 2 (3 marks)

iii) $y = (x + 3)^3$ 1 (3 marks)

QUESTION 2 (22 marks) (START A NEW BOOKLET)

- a) Is the function $f(x) = \frac{2x}{x^2 + 1}$ even, odd or neither? Give reasons for your answer? 0 (2 marks)
- b) Given that $f(x) = x^2 + 4x - 5$ find:
- i) $f(-2)$ (1 mark)
 - ii) x when $f(x) = 0$ 2 (2 marks)
 - iii) $f(x+h) - f(x)$ 1 (2 marks)
- c) i) Sketch the function $y = x^2, 0 \leq x \leq 2$ and write down its domain and range. 1 (3 marks)
- ii) If y in (i) is part of an odd function $f(x)$ defined for $-2 \leq x \leq 2$, sketch on a second diagram the function $f(x)$. 0 (2 marks)
- d) What is the equation of a circle with centre $(3, -1)$ and radius 3? State its domain and range. (3 marks)
- e) i) State the domain and the range of the function $f(x) = -\sqrt{1-x^2}$ 2 (2 marks)
- ii) Sketch the graph of $f(x) = -\sqrt{1-x^2}$ 1 (1 mark)
- f) Shade the region of the plane which simultaneously holds for the graphs (4 marks)

$$x + y > 1$$

$$y \leq 2$$

$$y \leq 4 - x^2$$

Question 1

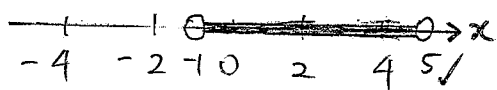
$$1) x = \frac{6 \pm \sqrt{36 - 4(3)(1)}}{6}$$

$$= \frac{6 \pm \sqrt{24}}{6} = \frac{6 \pm 2\sqrt{6}}{6} = \frac{3 \pm \sqrt{6}}{3} \checkmark$$

$$= 1.82 \text{ or } 0.18 \checkmark$$

$$2) |x-2| < 3 \rightarrow -1 < x < 5 \checkmark$$

$$-3 < x-2 < 3 \checkmark$$



$$3) \begin{cases} 2x + y = 7 & \text{--- (1)} \\ x - 2y = 1 & \text{--- (2)} \end{cases}$$

$$x = 2y + 1 \text{ sub into (1)}$$

$$4y + 2 + y = 7$$

$$5y = 5 \checkmark$$

$$y = 1 \text{ sub in (1)}$$

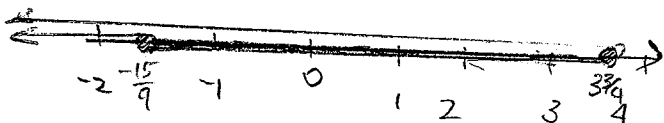
$$2x + 1 = 7$$

$$x = 3 \checkmark$$

$$\therefore \begin{cases} x = 3 \\ y = 1 \end{cases} \checkmark$$

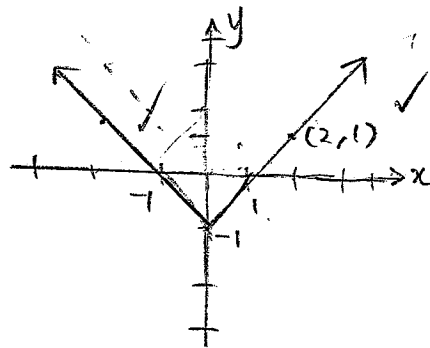
$$d) \begin{cases} 4x \leq 15 & \text{or} & -9x \geq 15 \\ x \leq \frac{15}{4} \checkmark & & x \leq -\frac{15}{9} \end{cases}$$

$$\therefore -\frac{15}{9} \leq x \leq \frac{15}{4}$$

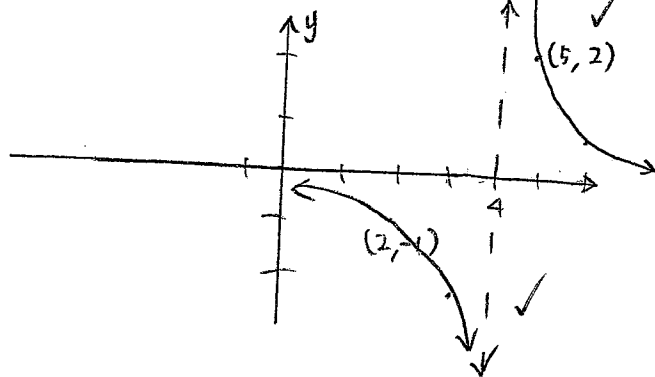


- (e) (i) function \checkmark
 (ii) function \checkmark
 (iii) Relation \checkmark
 (iv) function \checkmark
 (v) Relation \checkmark
- V. Good effort!

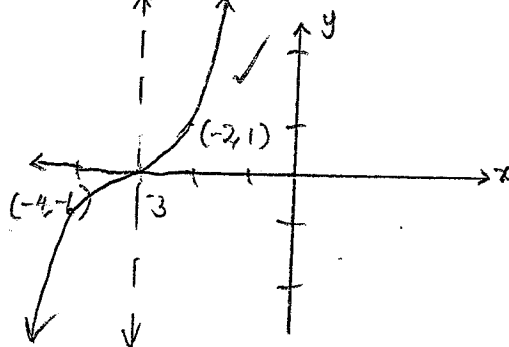
$$(f) |y| = |x| - 1$$



$$(ii) y = \frac{2}{x-4}$$



$$(ii) y = (x+3)^3$$



Question 2

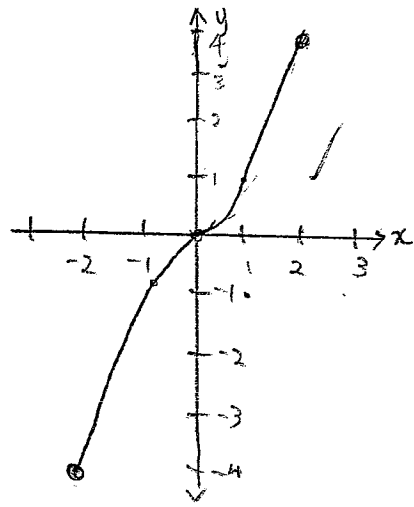
a) $f(x) = \frac{2x}{x^2+1}$

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

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

∴ $f(x)$ is odd as $f(-x) = -f(x)$ ✓

ii)



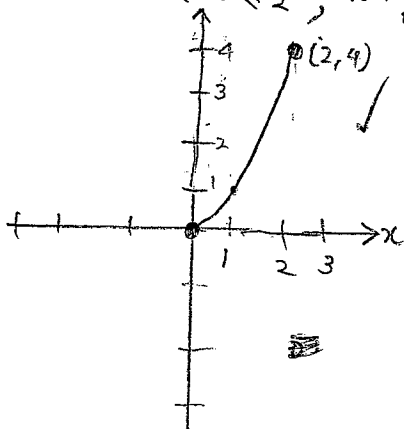
b) (i) $f(-2) = (-2)^2 + 4(-2) - 5$
 $= 4 - 8 - 5$
 $= -9$ ✓

(ii) $x^2 + 4x - 5 = 0$
 $(x+5)(x-1) = 0$ ✓
 $\therefore x = -5, 1$ ✓

(iii) $f(x+h) = (x+h)^2 + 4(x+h) - 5$
 $= x^2 + 2xh + h^2 + 4x + 4h - 5$

∴ $f(x+h) - f(x)$
 $= \cancel{x^2} + 2xh + \cancel{h^2} + \cancel{4x} + 4h - \cancel{5} - \cancel{x^2} - \cancel{4x} + \cancel{5}$
 $= 2xh + h^2 + 4h$ ✓

(c) (i) $y = x^2$; $D: 0 \leq x \leq 2$; $R: 0 \leq y \leq 4$



d) $(x-3)^2 + (y+1)^2 = 9$ ✓

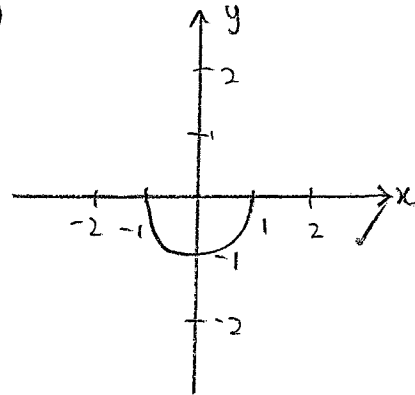
$D: \{0 \leq x \leq 6\}$ ✓

$R: \{-4 \leq y \leq 2\}$ ✓

e) (i) $D: \{-1 \leq x \leq 1\}$ ✓

$R: \{-1 \leq y \leq 0\}$ ✓

ii)



(f)

