



Waverley College
Year 11 Ext 1
Task 1

TIME ALLOWED: 50 MINUTES

NAME:

TEACHER:

INSTRUCTIONS:

Attempt all questions on your own A4 paper

Start each question on a new page

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	/20
Question 2	/20
Total	/40

Outcomes:

P1 - Demonstrates confidence in using mathematics to obtain realistic solutions to problems

P2 - Provides reasoning to support conclusions which are appropriate to the context

P3 - performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions

P4 - Chooses and applies appropriate arithmetic, algebraic, graphical, trigonometric and geometric techniques

Question 1

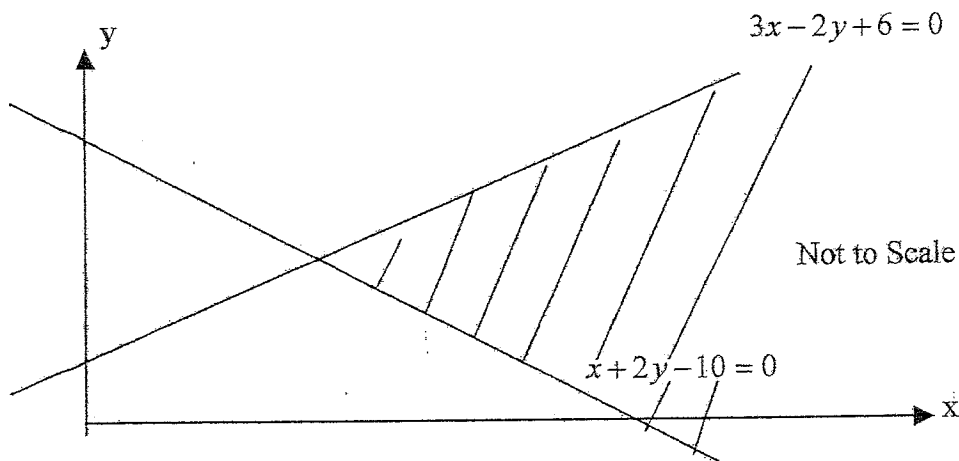
20 Marks

a) Consider the circle $x^2 + y^2 - 2x - 14y + 25 = 0$

Find the centre and radius?

3 marks

b) The diagram below shows the graphs $3x - 2y + 6 = 0$ and $x + 2y - 10 = 0$



State the pair of inequalities which define the shaded region.

2 marks

c) A function $f(x)$ is defined as :

$$f(x) = \begin{cases} 2 - x & \text{for } x < -3 \\ 5 & \text{for } -3 \leq x < 0 \\ x^2 - 1 & \text{for } x \geq 0 \end{cases}$$

i) Calculate the value of

$\alpha) f(-10)$

1 mark

$\beta) f(-3)$

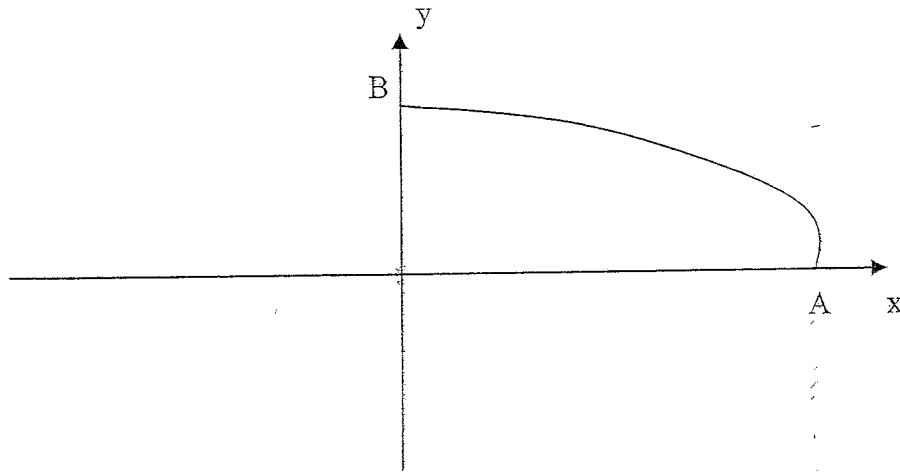
1 mark

$\chi) f(a^2)$

1 mark

- ii) Sketch the graph of $y = f(x)$ over the domain $-5 \leq x \leq 2$, showing all essential features including any intercepts with the axes. **3 marks**

d)



The diagram above shows part of the graph of the function $y = f(x)$. You are told it is an odd function.

Copy and complete the graph of the function.

2 marks

e) For the function $y = \frac{1}{x^2 - 1}$

i) Show algebraically that it is an even function

2 marks

ii) Explain the geometrical property shown by an even function

1 mark

iii) Write the domain of the function

1 mark

iv) Explain what happens to the y value as x gets very large

1 mark

v) Where does the graph cut the y axis.

1 mark

f) Explain why $x^2 + y^2 = 49$ is not a function

1 mark

Question 2 20 Marks

- a) On separate number planes sketch each of the following graphs **4 marks each**
Your sketches need to show all intercepts and critical points.

i) $y = x^2 - 2x - 15$

ii) $y = \frac{x-1}{x-3}$

iii) $y = |x+2|$

iv) $y = \sqrt{49-x^2}$

v) $y = \frac{1}{x-5}$

End of Examination

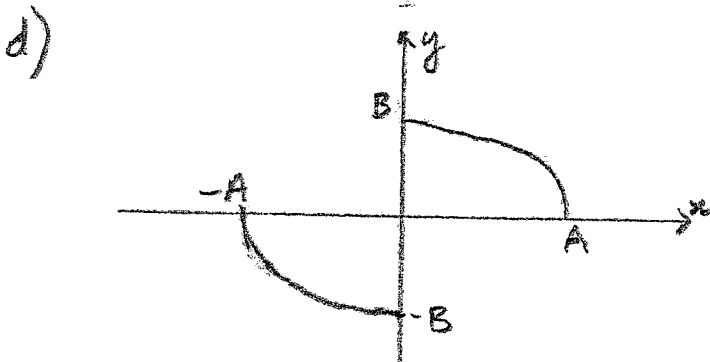
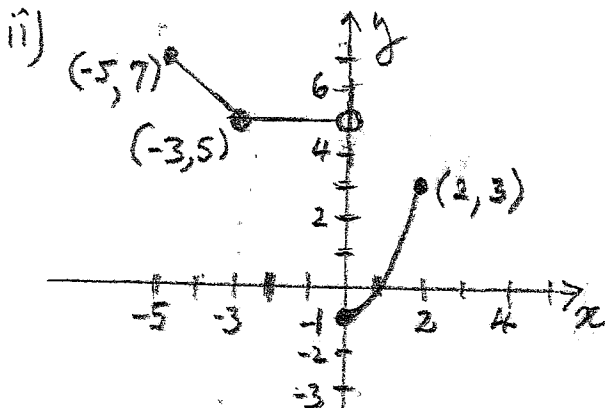
SOLUTIONS - WAVERLEY TASK 1 2007. EXT 1,

Quest 1

a) $x^2 - 2x + y^2 - 14y = -25$
 $x^2 - 2x + 1 + y^2 - 14y + 49 = -25 + 1 + 49$
 $(x-1)^2 + (y-7)^2 = 25$
 Circle centre $C = (1, 7)$ rad. = 5

b) $\{3x - 2y + 6 \geq 0\} \cap \{x + 2y - 10 \geq 0\}$

c) (i) $f(-10) = 12, f(-3) = 5$
 $f(a^2) = a^4 - 1$



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

ii) $f(x)$ is symmetric about y-axis

iii) $x^2 - 1 \neq 0$, so domain D is

$D = \{\text{all real } x : x \neq 1 \text{ \& } x \neq -1\}$ (V)

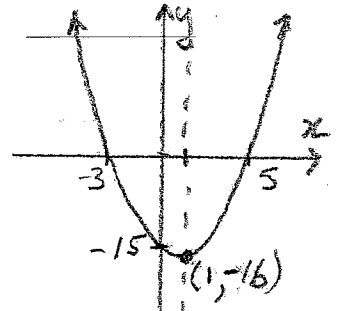
iv) as $x \rightarrow \infty$ $y \rightarrow 0$

v) at $(0, -1)$

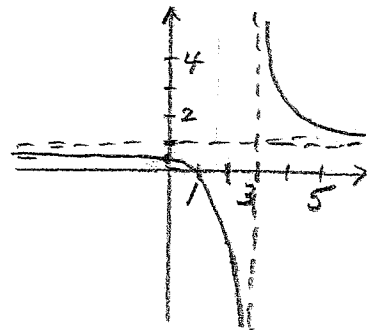
f) For each x -value in $-7 < x < 7$ there are 2 y -values. i.e. It fails the vertical line test.

Quest 2

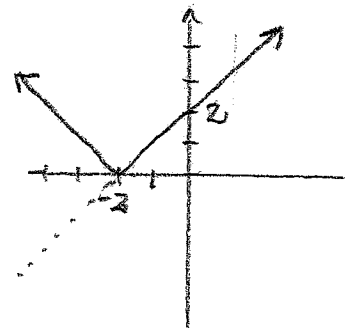
(i) $y = (x-5)(x+3)$
 axis of symmetry $x = 1$
 Vertex = $(1, -16)$



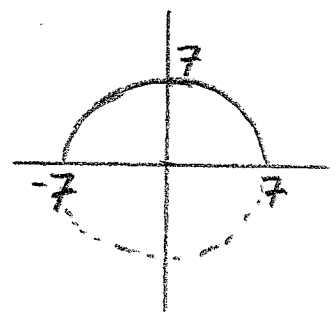
(ii) $y = \frac{x-3+2}{x-3}$
 $y = 1 + \frac{2}{x-3}$
 $x=0$ $y = \frac{1}{3}$
 $y=0$ $x = 1$



(iii) For $x \geq -2$
 Sketch $y = x + 2$
 For $x < -2$
 Sketch $y = -x - 2$



(iv) $y^2 = 49 - x^2$
 $x^2 + y^2 = 49$
 Circle centre $(0, 0)$
 radius 7.
 But $y = \sqrt{49 - x^2} \geq 0$



(v)

