

Student Number: _____

St. Catherine's School
Waverley

2007
ASSESSMENT TASK 2
(20%)

Mathematics Year 11

General Instructions

- Working time – 55 minutes
- Start each question on a new page in your answer booklet.
- If any additional booklet is used, please label it clearly and attach it to the appropriate booklet.
- Write using black or blue pen only.
- Board-approved calculators may be used.
- All necessary working must be shown.
- Marks may be deducted for careless or badly arranged work

Total marks – 50

- Attempt Questions 1–4
- Marks for each question are indicated on the back of this page.

QUESTION 1

(12 marks)

a) Solve for x and graph on separate number lines:

6

i) $-3 \leq 2x + 1 \leq 15$

ii) $x^2 - 5x \geq 0$

iii) $|x - 2| < 4$

b) Solve for x :

4

i) $3x^2 - 10x + 7 = 0$

ii) $x^2 - 9x = 4$

c) Solve simultaneously:

2

$$x + y = 6$$

$$7x - 2y = 51$$

QUESTION 2 *Start a new page*

(12 Marks)

a) i) Sketch the graph $y = \sqrt{9 - x^2}$.

2

ii) On the same set of axes, sketch the graph of $y = 2$

1

iii) By solving simultaneously, show that the graphs intersect at $x = \pm\sqrt{5}$

2

iv) Hence solve the inequality $\sqrt{9 - x^2} \geq 2$

1

b) Shade the region bounded by

4

$$y > -2$$

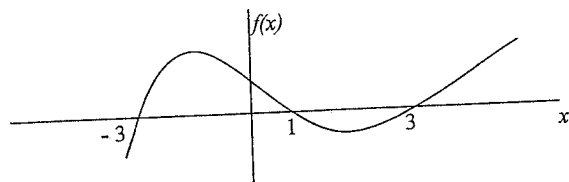
$$y < 6 + x - x^2$$

QUESTION 3

Start a new page

(12 Marks)

- a) Prove that $f(x) = \frac{5x^2}{1+x^2}$ is an even function 3
- b) Sketch the parabola $y = x^2 - 12x + 20$ 4
showing the x- and y-intercepts, and the co-ordinates of the vertex.
- c) Draw up a table of values with $-1 \leq x \leq 4$ for the function 3
 $f(x) = |x - 2| + x$
Graph the function on the number plane.
- d) For this graph of $y = f(x)$, state the values of x for which $f(x) > 0$ 2



QUESTION 4

Start a new page

(14 Marks)

- a) What is the natural domain of the function $f(x) = \frac{6}{x^2 - 4x - 12}$ 2
- b) $F(x) = 9x + x^2$ Find the value of 3
 - i) $F(-2)$
 - ii) $F(h + 2)$
- c) The curve $f(x) = x^2 - 2x + a$ passes through the point (5,3). 2
Find the value of a .
- d) i) Sketch the curve $(x - 4)^2 + y^2 = 16$, showing any intercepts 2
ii) Is $(x - 4)^2 + y^2 = 16$ a function? \checkmark 1
- e) i) Sketch the curve $f(x) = 2^x$, showing any intercepts 2
ii) What is the domain of $f(x) = 2^x$ 1
ii) What is the range of $f(x) = 2^x$ 1

End of Test

Question 1

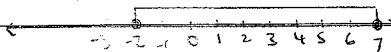
a)

i) $-3 \leq 2x+1 \leq 15$

$-4 \leq 2x \leq 14$

$-2 \leq x \leq 7$ ✓

2

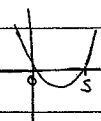


ii) $x^2 - 5x \geq 0$

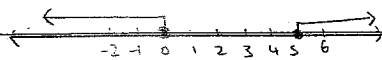
$x(x-5) \geq 0$

$x \geq 5$ ✓

$x \leq 0$



2

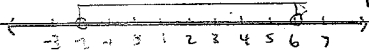


iii) $|x-2| < 4$

$-4 < x-2 < 4$

$-2 < x < 6$ ✓

2



b)

i) $3x^2 - 10x + 7 = 0$

$3x^2 - 3x - 7x + 7 = 0$

$3x(x-1) - 7(x-1) = 0$

$(3x-7)(x-1) = 0$

$x = \frac{7}{3}, 1$

2

ii) $x^2 - 9x = 4$

$x^2 - 9x - 4 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{9 \pm \sqrt{9^2 - 4 \times 1 \times -4}}{2 \times 1}$

$= \frac{9 \pm \sqrt{97}}{2}$

$x = \frac{9 + \sqrt{97}}{2}$ ✓

$= \frac{9 + 9.848854215 \dots}{2}$
 $= 9.424427107 \dots$ (2dp)

2

$x = \frac{9 - \sqrt{97}}{2}$ ✓

$= \frac{9 - 9.848854215 \dots}{2}$
 $= -0.424427107 \dots$ (2dp)

c) $x + y = 6$ ①

$y = 6 - x$ (A)

$7x - 2y = 51$ ②

subst (A) into ②

$7x - 2(6-x) = 51$

$7x - 12 + 2x = 51$

$9x = 63$

$x = 7$

subst $x = 7$ in (A)

$y = 6 - 7$

$= -1$

2

12

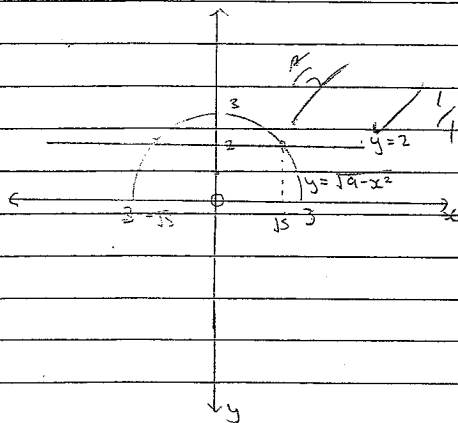
Question 2

10/10

a)

i

ii



iii) subst $y=2$ into $y=\sqrt{9-x^2}$

$$\sqrt{9-x^2} = 2$$

$$9-x^2 = 4$$

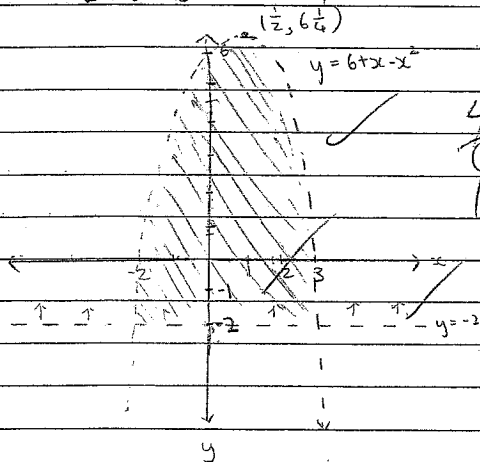
$$5 = x^2$$

$$x = \pm\sqrt{5}$$

iv) $-\sqrt{5} \leq x \leq \sqrt{5}$

2/2

b)



4

$$y = 6+x-x^2$$

x-int set $y=0$

$$x^2-x-6=0$$

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

$$x = -2, 3$$

y-int set $x=0$

$$y = 6+0-0$$

$$= 6$$

axis of symmetry = $-\frac{-1}{2}$

$$= \frac{1}{2}$$

subst $x = \frac{1}{2}$

$$y = 6 + \frac{1}{2} - \left(\frac{1}{2}\right)^2$$

$$= 6\frac{1}{4} \quad \text{Vertex } \left(\frac{1}{2}, 6\frac{1}{4}\right)$$

Question 3

12/12

a) $f(x) = \frac{5x^2}{1+x^2}$

$$f(-x) = \frac{5(-x)^2}{1+(-x)^2}$$

$$= \frac{5x^2}{1+x^2}$$

$$= f(x)$$

\therefore it is an even function.

3/3

b) $y = x^2 - 12x + 20$

$$= (x-2)(x-10)$$

To find x-int set $y=0$

$$(x-2)(x-10) = 0$$

$$x = 2, 10$$

To find y-int set $x=0$

$$y = 0 - 0 + 20$$

$$= 20$$

Axis of symmetry

$$x = \frac{2+10}{2}$$

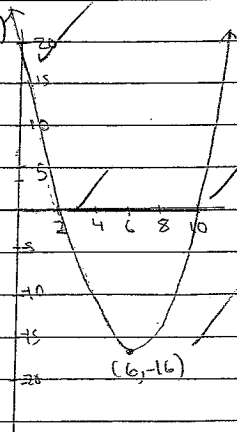
$$= 6$$

subst $x=6$ int equation

$$y = 6^2 - 12(6) + 20$$

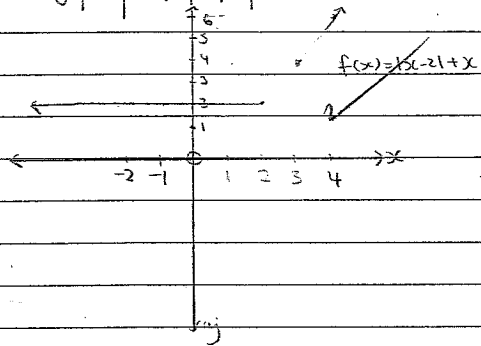
$$= -16$$

Vertex $(6, -16)$



c) $f(x) = |x-2| + x$

x	-1	0	1	2	3	4
y	2	2	2	2	4	6



d) $-3 < x < 1$
 $x > 3$

Question 4

a) $f(x) = \frac{6}{x^2 - 4x - 12}$

$= \frac{6}{(x+2)(x-6)}$

$(x+2)(x-6) \neq 0$

$x \neq -2, 6$

D: all real x $x \neq -2, 6$

b)

i) $F(-2) = 9(-2) + (-2)^2$

$= -14$

ii) $F(h+2) = 9(h+2) + (h+2)^2$

$= 9h + 18 + h^2 + 4h + 4$

$= h^2 + 13h + 22$

$= (h+11)(h+2)$ NR

c) $f(x) = x^2 - 2x + a$

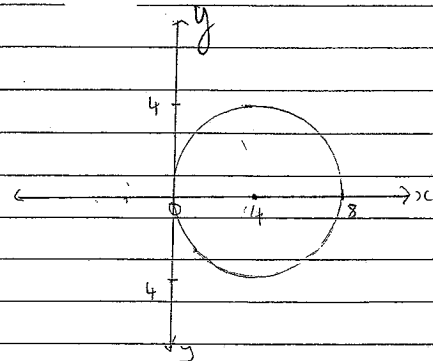
$3 = 5^2 - 2(5) + a$ sub $P(5,3)$

$= 15 + a$

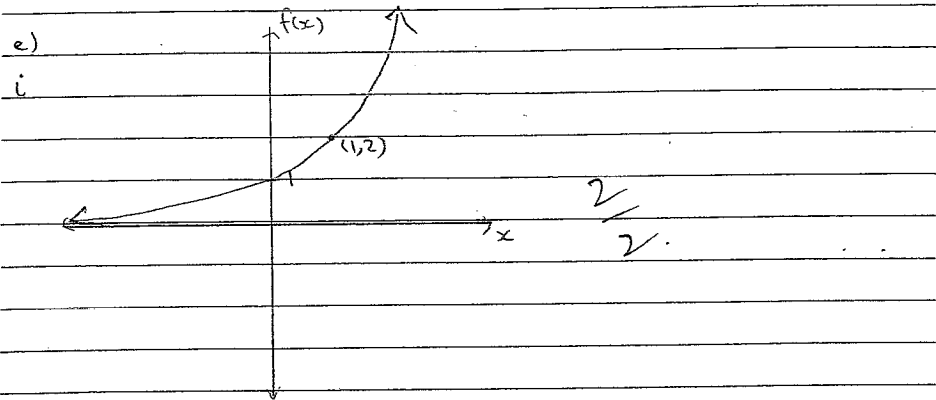
$a = -12$

d)

i)



ii) no $(x-4)^2 + y^2 = 16$ is a relation.



ii) D: all real x ✓ 2 ✓

iii) R: $y > 0$ ✓ 2 ✓