

NAME: _____

**YEAR 11 2 UNIT MATHEMATICS
ASSESSMENT TASK #3 (15%)**

WORKING TIME: 45 minutes.

INSTRUCTIONS:

- Write using blue or black pen
- Sketch graphs using a pencil and ruler
- Board-approved calculators may be used
- All necessary working out should be shown in every question
- Start each question in a new booklet
- Make sure that your name is on every booklet

Total Marks	/42	%
-------------	-----	---

MARKING GRIDS – Teacher Use Only

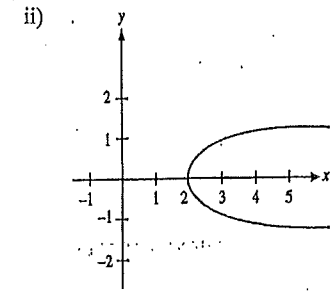
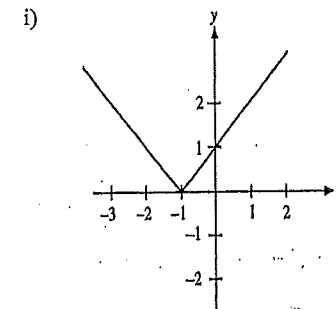
QUESTION	1	2a	2b	3ab	3c I iii iv	3c ii
Knowledge and Skills	13		3		4	
Reasoning and Communication		12		7		3

Knowledge and Skills	= 20	48. %
Reasoning and Communication	= 22	52 %

Question 1 (13 marks)

a) State the difference between a function and a relation. 1

b) Are the following are functions or relations? 3



iii) (4, 7) (3, 8) (-2, 7) (5, 2)

c) Determine whether the following functions are even, odd or neither. 2

Show all working.

i) $f(x) = x^3 + 1$

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

d) Given the function $f(x) = x^2 + 3x$, find

i) $f(-1) + [f(2)]^2$ 2

ii) $f\left(\frac{1}{x}\right)$ 1

iii) $f(x+h) - f(x)$ 2

e) State the domain of the function 2

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

End of Question 1

Question 2 (15 marks) Start a new booklet.

a) Draw neat sketches of the following graphs on separate number planes. Clearly show intercepts and any asymptotes where required.

(i) $y = 2x - x^2$ (Include coordinates of the vertex.) 3

(ii) $y = |x + 2|$ 3

(iii) $y = 4^x$ 3

(iv) $(x+1)^2 + y^2 = 16$ (No need to find values of y -intercepts) 3

b) Use your sketches in part a) to answer the following questions

(i) For what values of x is $y = 2x - x^2$ decreasing? 1

(ii) State the domain and range of $(x+1)^2 + y^2 = 16$ 2

End of Question 2

Question 3 (14 marks) Start a new booklet.

a) Sketch the region where $4x - 3y < 12$ 3

b) Sketch the intersection of the regions $y \geq \sqrt{4-x^2}$ and $y > 0$ 4

c) The function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} x+1, & -2 \leq x < 3 \\ 4, & 3 \leq x \leq 5 \end{cases}$$

(i) Find $f(-2) + f(2) - f(5)$ 2

(ii) Draw a neat ^{graph} sketch of the function over the domain $-2 \leq x \leq 5$.
Use an accurate scale 3

(iii) For what values of x is $f(x)$ increasing? 1

(iv) State the range of the function over the given domain. 1

End of Examination

a) A function is a set of ordered pairs where every x-value has only one y-value. A relation may have more than one y-value for every x-value.

bi) function
ii) relation
iii) function

ci) $f(-x) = (-x)^3 + 1 = -x^3 + 1$
 $\neq f(x)$
 $\neq -f(x)$ \therefore neither

ii) $f(-x) = \frac{(-x)^2 - 2}{5} = \frac{x^2 - 2}{5}$
 $= f(x)$ \therefore even

di) $f(-1) = (-1)^2 + 3(-1) - 1 = 1 - 3 - 1 = -2$
 $f(2) = 2^2 + 3(2) - 1 = 4 + 6 - 1 = 10$

$[f(2)]^2 = 10^2 = 100$
 $\therefore f(-1) + [f(2)]^2 = -2 + 100 = 98$

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

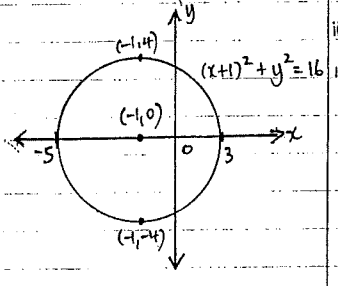
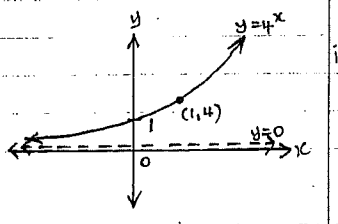
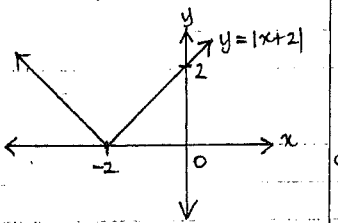
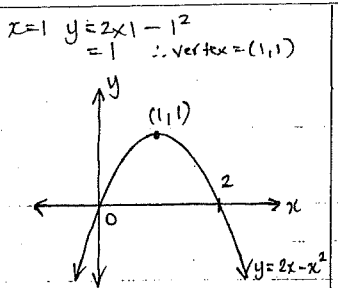
iii) $f(x+h) = (x+h)^2 + 3(x+h) = x^2 + 2xh + h^2 + 3x + 3h$

$\therefore f(x+h) - f(x) = x^2 + 2xh + h^2 + 3x + 3h - (x^2 + 3x) = 2xh + h^2 + 3h$

e) $x^2 - 2x - 3 \neq 0$
 $x^2 - 2x - 3 = (x+1)(x-3)$
 $x+1 \neq 0 \Rightarrow x \neq -1$
 $x-3 \neq 0 \Rightarrow x \neq 3$

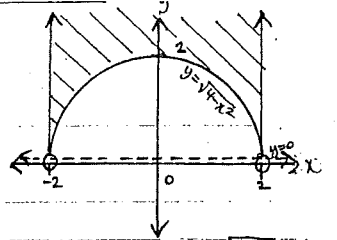
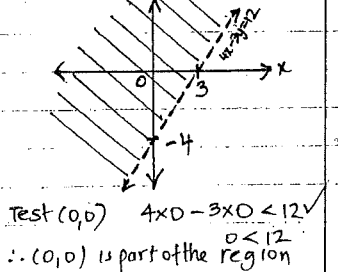
\therefore Domain is all real x except $x = -1$ and $x = 3$

ii) $y = 2x - x^2 = x(2-x)$
y-intercept $\Rightarrow x=0 \Rightarrow y=0$
x-intercepts $\Rightarrow y=0 \Rightarrow x(2-x)=0 \Rightarrow x=0$ or $x=2$
Parabola is symmetrical \therefore x-coordinate of vertex = $\frac{0+2}{2} = 1$



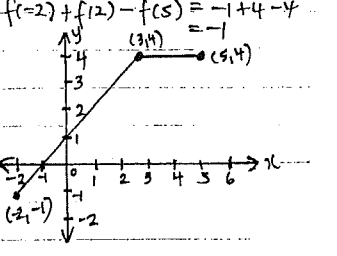
bi) $x > 1$
ii) domain: $-5 \leq x \leq 3$
range: $-4 \leq y \leq 4$

Q3) a) x-intercepts $\Rightarrow y=0$
 $4x - 3x = 12 \Rightarrow x = 12$
y-intercepts $\Rightarrow x=0$
 $4(0) - 3y = 12 \Rightarrow y = -4$



Test	$y > 0$	$y \geq \sqrt{4-x^2}$
$(-3, 2)$	$2 > 0$ ✓	$2 \geq \sqrt{4-(-3)^2}$ ✗
$(-2, 3)$	$3 > 0$ ✓	$3 \geq \sqrt{4-(-2)^2}$ ✓
$(0, 3)$	$3 > 0$ ✓	$3 \geq \sqrt{4-0^2}$ ✓
$(2, 2)$	$2 > 0$ ✓	$2 \geq \sqrt{4-2^2}$ ✓
$(3, 2)$	$2 > 0$ ✓	$2 \geq \sqrt{4-3^2}$ ✗
$(0, 1)$	$1 > 0$ ✓	$1 \geq \sqrt{4-0^2}$ ✗

ci) $f(-2) = -2+1 = -1$
 $f(2) = 4$
 $f(5) = 4$



iii) $-2 < x < 3$
iv) $-1 \leq f(x) \leq 4$