

(3 marks)

$$\text{b) } \frac{7}{x+4} = -1 - \frac{2}{4-x}$$

(2 marks)

(5 marks)

2. Solve the following equations.
- a)  $12 - 2(4 - 3x) = x - 11$

RULE	DOMAIN	RANGE
a) $y = \frac{x-1}{3}$		
b) $y = \frac{x^2+2}{1}$		

1. State the domain and range of the following functions.

Working Time: 35 minutes

## SECTION 1 - Resource Free

36

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All working is to be shown in the space provided. Your working should be in sufficient detail to allow your answers to be checked readily so that marks may be awarded if the answer is incorrect. For any question worth more than 2 marks valid working or justification must be shown to be awarded full marks.

Equipment: Pens, pencils, highlighter, ruler, correction tape or fluid, SCSA formula sheet

Name: \_\_\_\_\_

APPLECROSS  
SENIOR HIGH SCHOOL

Test Date: 30 March 2021

Relations, Functions, Linear and Quadratics

Year 11 Methods Unit 1 Test 2

3. Given  $f(x)=2x+10$  and  $g(x)=2-2x-x^2$ ,

a) Find:

(i)  $3f(1)$

(ii)  $f(3)-g(2)$

(13 marks)

(3 marks)

- b) Find the value of  $t$  if  $f(t)=-17$

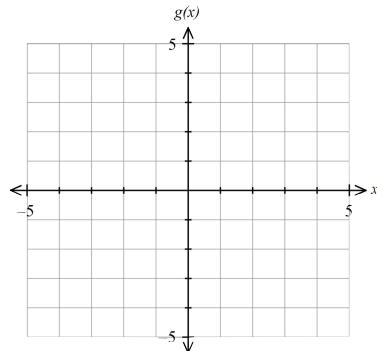
(2 marks)

- c) If the domain of  $f$  is the set of **integers** between  $-2$  and  $3$ , ie  $\{x : -2 < x < 3, x \text{ is an integer}\}$   
find the range of  $f(x)$ .

(3 marks)

- d) The co-ordinate and nature of the turning point of  $g(x)$  and hence sketch on the axes  
below.

(5 marks)



12.

A rope suspension bridge is constructed between the edges  $A$  50 metres above the river and point  $B$  is 48 metres above the river.  $A, B, C$  and  $D$  are in the same vertical plane with  $C$  directly below  $A$ .

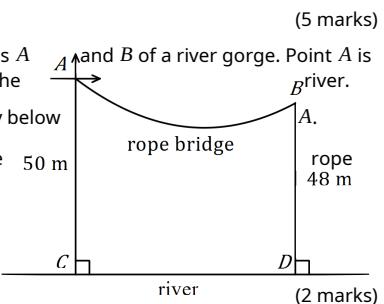
Using  $A$  as the origin of the Cartesian co-ordinate axes, the bridge between  $A$  and  $B$  can be modelled by the equation:

$$y=0.004x(x-60).$$

- a) Find the height of the lowest point of the rope bridge above the river.

$$TP=(30, -3.6) \checkmark$$

$$50-3.6=46.4 \text{ m } \checkmark$$



(5 marks)

(2 marks)

- b) Find the width of the gorge from  $C$  to  $D$ .

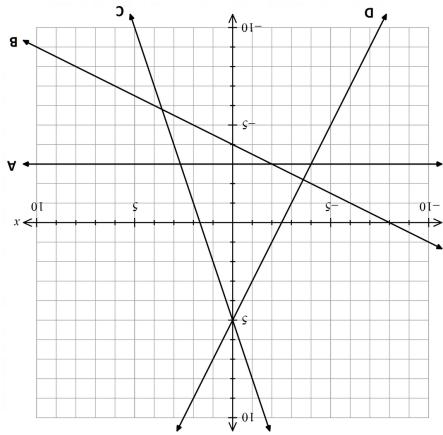
$$-2=0.004x(x-60) \checkmark$$

$$x=10, 50 \checkmark$$

$$50 \text{ m} \checkmark$$

(3 marks)

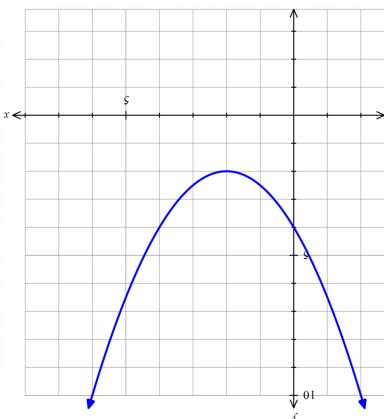
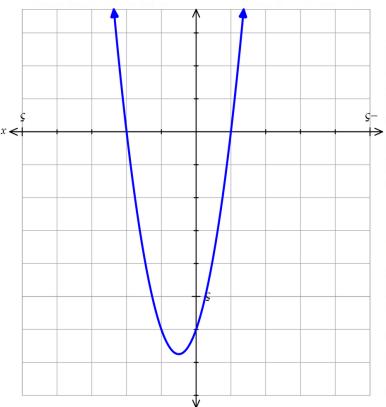
END OF SECTION 2



5. The graph shows four linear functions labelled A, B, C and D. Select the correct rule for each function from the list below. Write your answers in the table below.
- (4 marks)**

$$\begin{aligned}y &= -2x + 5 \\y &= 2x + 5 \\x + 2y &= -8 \\x + 2y &= -4 \\3x + y &= 5 \\-3x + y &= 5 \\y &= -3 \\x &= -3\end{aligned}$$

NOTE: Not all rules will be used.



4. Find the equations of the quadratic curves whose graphs are shown below. **(4 marks)**

Line	A	B	C	D
Rule				

10. Determine whether the following are functions.

(4 marks)

$$(2, -1), [5, 12], (-2, 11), (1, 6), (0, 11)$$

$$(7, 3), (-3, 2), (1, -3), (7, 5), (-1, 0)$$

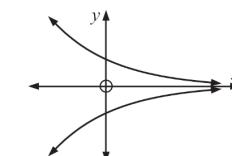
Not function one to many ✓

$$x^2 + y^2 = 4$$

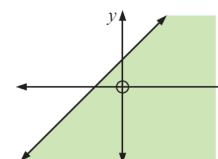
Not function one to many ✓

$$y = \frac{12x}{\sqrt{x-1}}$$

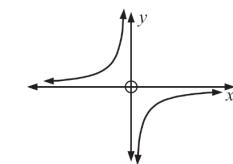
$$3x^2 + 2y = 7$$



Not function fails vertical line test ✓



Not function infinite values for  $y$  for each  $x$  value ✓



11. The vertices of a triangle have the coordinates  $A(2, 4)$ ,  $B(7, 4)$  and  $C(7, 2)$

(4 marks)

Determine the gradient of each side of the triangle to confirm this is right triangle and state which vertex is right angled.

$$m_{AB} = \frac{4-4}{7-2} = 0 \quad \checkmark$$

$$m_{BC} = \frac{4-2}{7-7} = \infty$$

$\therefore AB \perp BC$  ✓

Right angled at  $B$  ✓

$y$	1	7	3	-1	5
$x$	4	1	3	5	2

(e)

$y$	-2	2	8	16	26	38
$x$	0	1	2	3	4	5

(b)

$y$	3	9	27	81	243
$x$	1	2	3	4	5

(a)

6. Determine where the following are linear, quadratic or neither. For those that are, linear or quadratic, determine the rule.  
 (6 marks)

$$k = \frac{7}{18} \wedge$$

$$\frac{4}{7} = \frac{k - (-2)}{4 - (-4)}$$

$$m = \frac{4}{7} \wedge$$

END OF SECTION 1

8. The line  $L$  passes through the points  $A(5, 13)$  and  $B(-3, 3)$ . Find:

(7 marks)

- a) The coordinates of  $M$ , the mid-point of  $AB$ .

(2 marks)

$$M = (1, 8) \checkmark \checkmark$$

- b) The coordinates of the point  $C$ , on the line  $L$ , which is as far from  $B$  as  $A$  is to  $B$ . (2 marks)

$$(-11, -7) \checkmark \checkmark$$

- c) The equation of the line through  $M$  that is parallel to the line  $3x+4y=12$ . (3 marks)

$$y = \frac{-3x}{4} + 3$$

$$m = \frac{-3}{4} \checkmark$$

$$y = \frac{-3x}{4} + c \Leftarrow (1, 8)$$

$$8 = \frac{-3(1)}{4} + c$$

$$c = \frac{35}{4} \checkmark$$

$$y = \frac{-3x}{4} + \frac{35}{4} \checkmark \text{ (or } y = -0.75x + 8.75 \text{ or } 4y + 3x = 35\text{)}$$

9.

(4 marks)

- a) Find the equation of the line that passes through the point  $(1, 12)$  and is perpendicular to  $y = \cancel{b} - 2x + 4$ .

(2 marks)

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

$$y = \frac{x}{2} + c \Leftarrow (1, 12)$$

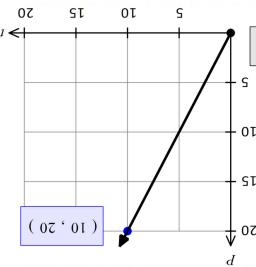
$$12 = \frac{1}{2} + c$$

$$c = 11.5$$

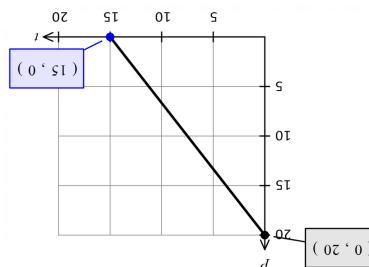
$$y = 0.5x + 11.5 \checkmark$$

- b) Find the value(s) of  $k$  if the following points are collinear.  $(-2, -4), (k, 4)$  and  $(6, 10)$  (2 marks)

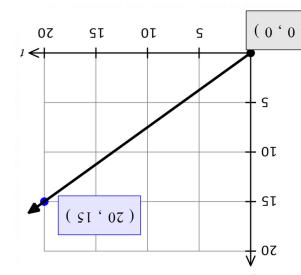
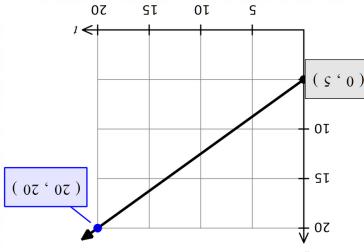
$$m = \frac{16 - (-4)}{6 - (-2)}$$



7



(2 marks)



Working Time: 20 minutes

## SECTION 2 - Resource Rich

<b>%</b>	Total	62
	Section 2	26
	Section 1	36
	Total	

All working is to be shown in the space provided.  
 Your working should be in sufficient detail to allow  
 your answers to be checked readily so part marks  
 may be awarded if the answer is incorrect. For any  
 question worth more than 2 marks valid working or  
 justification must be shown to be awarded full  
 marks.

To be provided by the student:  
 ClassPass and/or Scientific Calculators,  
 drawing template sheet of A4-sized paper

Name: \_\_\_\_\_

**APPLEROSS**  
 SENIOR HIGH SCHOOL


Test Date: 30 March 2021

Relations, Functions, Linear and Quadratics

Year 11 Methods Unit 1 Test 2

Not direct proportion  $P=2t \vee$ 

Not direct proportion

7. For the following graphs, state whether  $P$  and  $t$  vary with each other (i.e. are directly proportional to each other) or not and, for those cases when direct proportion is involved find the rule for the relationship.

For the following graphs, state whether  $P$  and  $t$  vary with each other (i.e. are directly proportional to each other) or not and, for those cases when direct proportion is involved find the rule for the relationship.

**Year 11 Methods Unit 1 Test 2****Relations, Functions, Linear and Quadratics**

Test Date: 30 March 2021

**APPLECROSS**

SENIOR HIGH SCHOOL

Name: \_\_\_\_\_

All working is to be shown in the space provided.  
Your working should be in sufficient detail to allow  
your answers to be checked readily so part marks  
may be awarded if the answer is incorrect. For any  
question worth more than 2 marks valid working or  
justification must be shown to be awarded full  
marks.

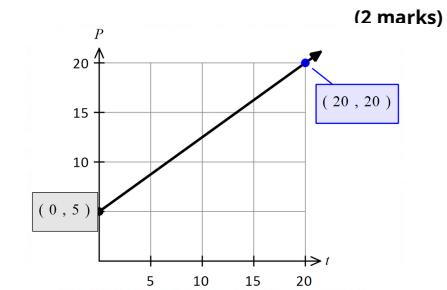
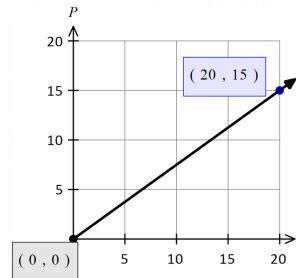
**To be provided by the student:**

ClassPad and/or Scientific Calculators,  
drawing templates 1 sheet of A<sub>4</sub>-sized paper

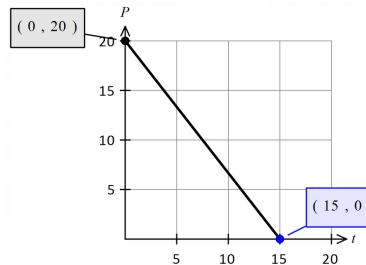
		Total	%
Section 1		36	
Section 2		26	
Total		62	

**SECTION 2 – Resource Rich****Working Time: 20 minutes**

7. For the following graphs, state whether  $P$  and  $t$  vary with each other (i.e. are directly proportional to each other) or not and, for those cases when direct proportion is involved find the rule for the relationship.

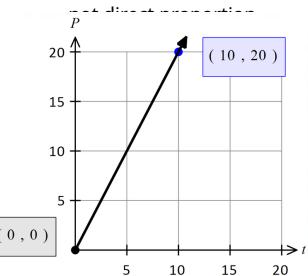


Direct proportion  $P = \frac{3t}{4}$  ✓



8

21



8. The line  $L$  passes through the points  $A(5, 13)$  and  $B(-3, 3)$ . Find:
- a) The coordinates of the point  $C$ , on the line  $L$ , which is as far from  $B$  as  $A$  is to  $B$ . (2 marks)
- b) The equation of the line through  $M$  that is parallel to the line  $3x+4y=12$ . (3 marks)

(2 marks)

- 9.
- a) Find the equation of the line that passes through the point  $(1, 12)$  and is perpendicular to  $y = 2 - 2x + 4$ . (4 marks)

- c) The equation of the line through  $M$  that is parallel to the line  $3x+4y=12$ . (3 marks)

- b) The coordinates of the point  $C$ , on the line  $L$ , which is as far from  $B$  as  $A$  is to  $B$ . (2 marks)

8. The line  $L$  passes through the points  $A(5, 13)$  and  $B(-3, 3)$ . Find:
- a) The coordinates of  $M$ , the mid-point of  $AB$ . (2 marks)

END OF SECTION 1

$$y = -2x + 9$$

**6.**

Determine where the following are linear, quadratic or neither. For those that are linear or quadratic, determine the rule.

**a)**

$x$	1	2	3	4	5
$y$	3	9	27	81	243

Constant ratio therefore not a linear or quadratic function ✓

**b)**

$x$	0	1	2	3	4	5
$y$	-2	2	8	16	26	38

4      6      8      10      12  
2      2      2      2      2

Constant second difference therefore quadratic

$$c = -2 \checkmark$$

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

$$a + b = 4$$

$$b = 4 - 1 = 3 \checkmark$$

$$\therefore y = x^2 + 3x - 2$$

**c)**

$x$	4	1	3	5	2
$y$	1	7	3	-1	5

$x$	0	1	2	3	4	5
$y$	9	7	5	3	1	-1

-2      -2      -2      -2      -2

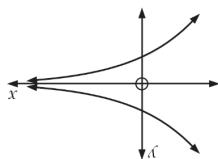
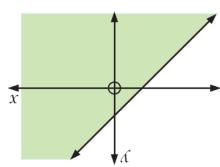
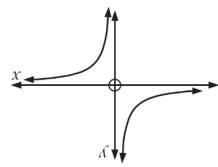
Constant first difference therefore linear

$$m = -2 \quad c = 9$$

Which vertex is right angled.

Determine the gradient of each side of the triangle to confirm this is right triangle and state

11. The vertices of a triangle have the coordinates  $A(2,4)$ ,  $B(7,4)$  and  $C(7,2)$  (4 marks)



$$3x^2 + 2y = 7$$

$$y = \frac{12x}{\sqrt{x-1}}$$

$$x^2 + y^2 = 4$$

10. Determine whether the following are functions.

(4 marks)

$$(2, -1), (5, 12), (-2, 11), (1, 6), (0, 11)$$

$$(7, 3), (-3, 2), (1, -3), (7, 5), (-1, 0)$$

Line	$y = -3x$	$x + 2y = -8$	$3x + y = 5$	$y = 2x + 5$
A	B	C	D	

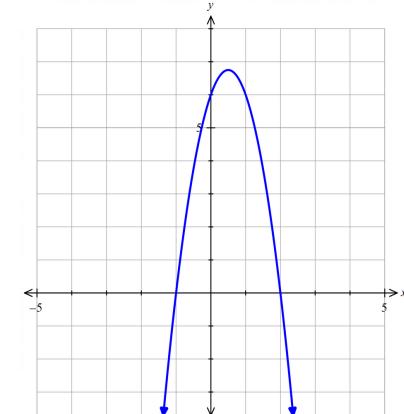
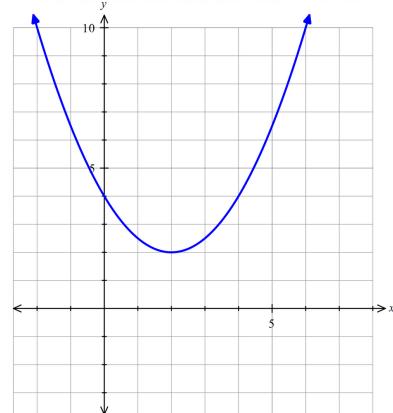
$$y = -2x + 5$$

✓ TP

✓ correct shape

4. Find the equations of the quadratic curves whose graphs are shown below.

(4 marks)



$$y = a(x-2)^2 + 2 \implies (0, 4)$$

$$4 = a(0-2)^2 + 2$$

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

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

$$y = a(x+1)(x-2) \implies (0, 6)$$

$$6 = a(0+1)(0-2)$$

$$a = -3 \checkmark$$

$$y = -3(x+1)(x-2) \checkmark$$

5.

(4 marks)

The graph shows four linear functions labelled A, B, C and D. Select the correct rule for each function from the list below. Write your answers in the table

NOTE: Not all rules will be used.

$$x = -3$$

$$y = -3$$

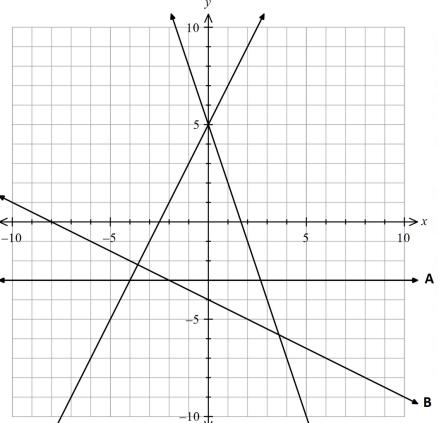
$$-3x + y = 5$$

$$3x + y = 5$$

$$x + 2y = -4$$

$$x + 2y = -8$$

$$y = 2x + 5$$



3. Given  $f(x) = 2x + 10$  and  $g(x) = 2 - 2x - x^2$ ,
- a) Find:
- A rope suspension bridge is constructed between the edges A and B of a river gorge. Point A is 50 metres above the river and point B is 48 metres above the river.
- Using A as the origin of the Cartesian co-ordinates axes, the 50 m bridge between A and B can be modelled by the equation:
- $y = 0.004x(x - 60)$ .
- b) Find the height of the lowest point of the rope bridge above the river.

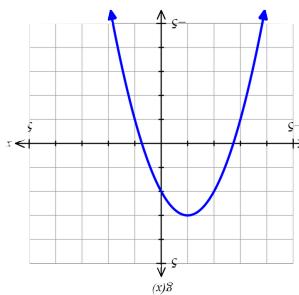
12.

- b) Find the width of the gorge from C to D. (3 marks)

- (i)  $3f(1)$  (ii)  $f(3) - g(2)$  (iii)  $f(2) - g(2)$
- ?36 ✓ ?22 ✓ ?16 - (-6) ✓
- $2(3) + 10 - [2 - 2(2) - (2)]$
- $2t + 10 - 2t - 17$
- 2t ✓ ? - 27 ✓ ? - 13.5 ✓
- c) If the domain of  $f$  is the set of integers between -2 and 3, ie  $\{x : -2 < x < 3, x \text{ is an integer}\}$  find the range of  $f(x)$ . Need  $f(-1), f(0), f(1), f(2)$
- $f(-1) = 8$
- $f(0) = 10$
- $f(1) = 12$
- $f(2) = 14$
- ∴ range is  $\{8, 10, 12, 14\}$

- v if correct range but not specified integers
- v v correctly shows integers but not correct range
- v v all correct integers,
- v v v all correct integers,
- v v v all correct integers but not correct range
- v v v all correct integers but not specified integers

- d) Find the co-ordinates and nature of the turning point of  $g(x)$  and hence sketch on the axes below.



16

y int

$$\therefore Tp \max(-1, 3) \checkmark$$

$$g(-1) = 2 - 2(-1) - (-1)^2$$

$$x = \frac{-b}{2a} = \frac{2(-1)}{-2} = -1$$

- 13
- a) Find the value of  $t$  if  $f(t) = -17$  (2 marks)
- b) Find the height of the lowest point of the rope bridge above the river. (2 marks)
- c) If the domain of  $f$  is the set of integers between -2 and 3, ie  $\{x : -2 < x < 3, x \text{ is an integer}\}$  find the range of  $f(x)$ . Need  $f(-1), f(0), f(1), f(2)$
- $f(-1) = 8$
- $f(0) = 10$
- $f(1) = 12$
- $f(2) = 14$
- ∴ range is  $\{8, 10, 12, 14\}$
- d) Find the co-ordinates and nature of the turning point of  $g(x)$  and hence sketch on the axes below.



**Year 11 Methods Unit 1 Test 2**  
**Relations, Functions, Linear and Quadratics**

Test Date: 30 March 2021

Name: SOLUTIONS

All working is to be shown in the space provided. Your working should be in sufficient detail to allow your answers to be checked readily so part marks may be awarded if the answer is incorrect. For any question worth more than 2 marks valid working or justification must be shown to be awarded full marks.

Equipment: Pens. pencils. highlighter. ruler. correction tape or fluid. SCSA Formula

36

**SECTION 1 – Resource Free****Working Time: 35 minutes**

1. State the domain and range of the following functions. **(4 marks)**

RULE	DOMAIN	RANGE
a) $y = \frac{3}{x-1}$	$\{x : x \neq 1\} \checkmark$	$\{y : y \neq 0\} \checkmark$
b) $y = y = \frac{1}{x^2+2}$	$\{x : x \in R\}$	$\left\{y : 0 < y \leq \frac{1}{2}\right\} \checkmark$

2. Solve the following equations. **(5 marks)**
- a)  $12 - 2(4 - 3x) = x - 11$  **(2 marks)**

$$12 - 8 + 6x \quad i \quad x - 11 \checkmark$$

$$5x \quad i \quad -15$$

$$x \quad i \quad -3 \checkmark$$

{ { } }

- b)  $\frac{x+4}{7} = -1 - \frac{4-x}{2}$  **(3 marks)**
- $2x + 8 \quad i \quad -14 - 28 + 7x \quad \checkmark$
- 50  $\quad i \quad 5x \quad \checkmark$