



Name: _____

Year 11 2020 Mathematics Advanced Assessment Task 2

Investigative Assignment

Task number: 2

Weighting: 30%

Due Date: Thursday
25/6/20

Outcomes assessed:

- MA11-1 Uses algebraic and graphical techniques to solve, and where appropriate, compare alternative solutions to problems
- MA11-2 Uses the concepts of functions and relations to model, analyse and solve practical problems
- MA11-8 Uses appropriate technology to investigate, organize, model and interpret information in a range of contexts
- MA11-9 Provides reasoning to support conclusions which are appropriate to the context

Nature and description of the task:

As a result of completing this Investigative Assignment, students should know and understand the basic features of the graphs of linear, quadratic, cubic, square root and hyperbolic functions. They should be able to identify key points of the graphs of these functions including intercepts, turning points, asymptotes and points of inflection. They will have examined dilations including graphs of $y = cf(x)$ and $y = f(dx)$. They will also have had the opportunity to choose and use appropriate technology during the preparation of this investigation.

The Investigative Assignment will consist of two parts:

- Part 1 Preparation Activity (value >> 50% of the overall Investigative Assignment) – completed at home. The suggested time for the Preparation Activity is one week, although you will have just over 2 weeks to complete it. All answers will need to be completed in this booklet but additional paper can be used and attached to this booklet. The marks allocated to each question are shown next to the question. All necessary working will need to be shown and answers/responses should be correct/detailed to obtain full marks. Graphing calculators/graphing technology e.g. Geogebra can be used during the Preparation Task.
- Part 2 Validation Task (value >> 50% of the overall Investigative Assignment) – to be conducted in class for a period of 50 minutes. The Preparation Activity cannot be used during the Validation Task but will be handed in together with the Validation Task at the conclusion of the task. Graphing calculators/graphing technology cannot be used during the Validation Task and all marks for each question will be clearly shown next to each question on the task.

Non-Completion of Task:

If you know you are going to be away on the day of the Validation Task and are unable to hand in / complete both parts of the Investigative Assignment on the due day, then you must have supportive documentation. *Zero marks will apply if the Assessment Task is submitted/completed late, unless an Illness/ Misadventure or Application for Extension form has been submitted.*

Part 1 Preparation Activity (55 Marks)

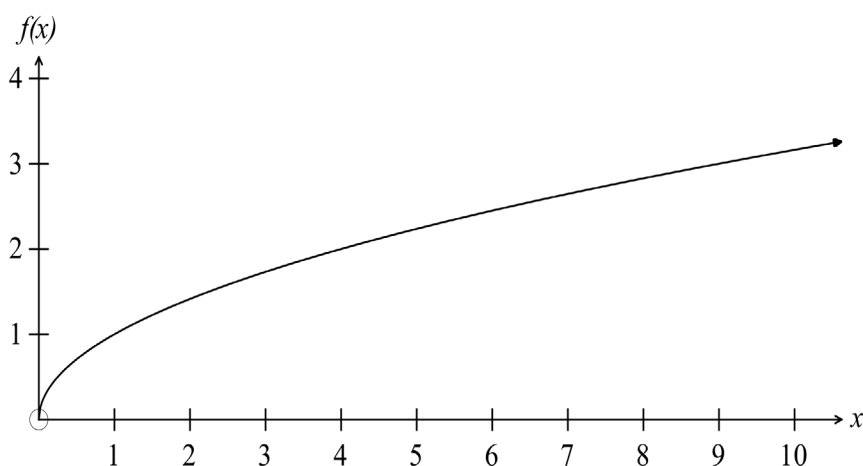
Extended investigation – Answer on your own paper and show all working

Question 1

(12 marks)

The function $f(x) = \sqrt{x}$ is defined for the domain $x \geq 0$. For values such that $x \leq 10$, the function is presented in tabular and graphic form below. Values have been chosen for x to allow $f(x)$ to be readily calculated.

x	0	1	4	9
$f(x)$	0	1	2	3



Investigate the transformation $y = f(kx)$ for $f(x) = \sqrt{x}$

i.e. $f(kx) = \sqrt{kx}$ for $k = 2, \frac{1}{2}, -2$ and $-\frac{1}{2}$.

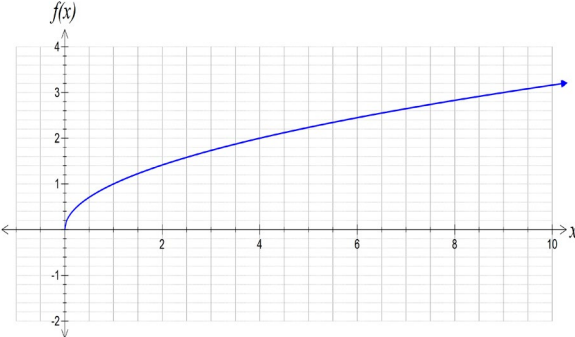
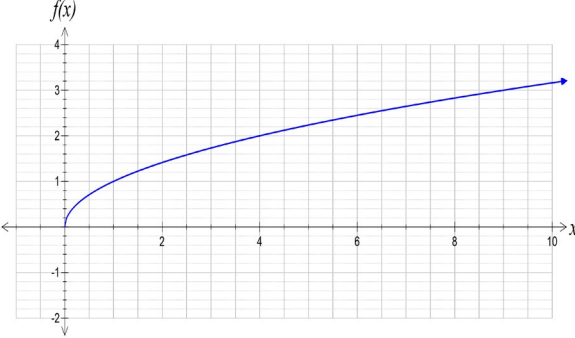
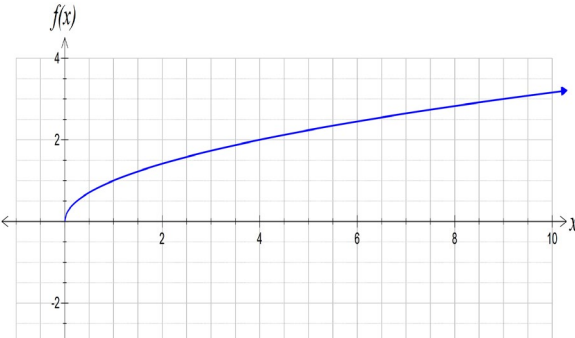
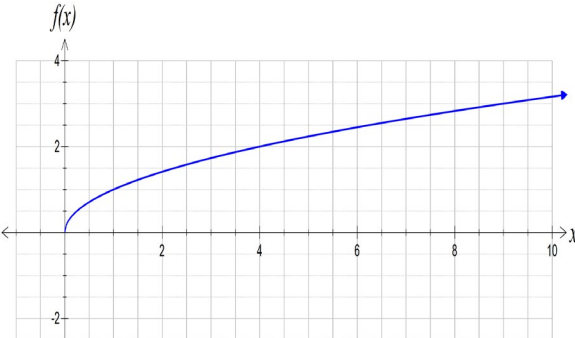
Summarise your results in the table provided on the next page by

- sketching the transformation on the axes provided. (4)
- describing the transformation that has occurred in relation to the value of k . (8)

Note:

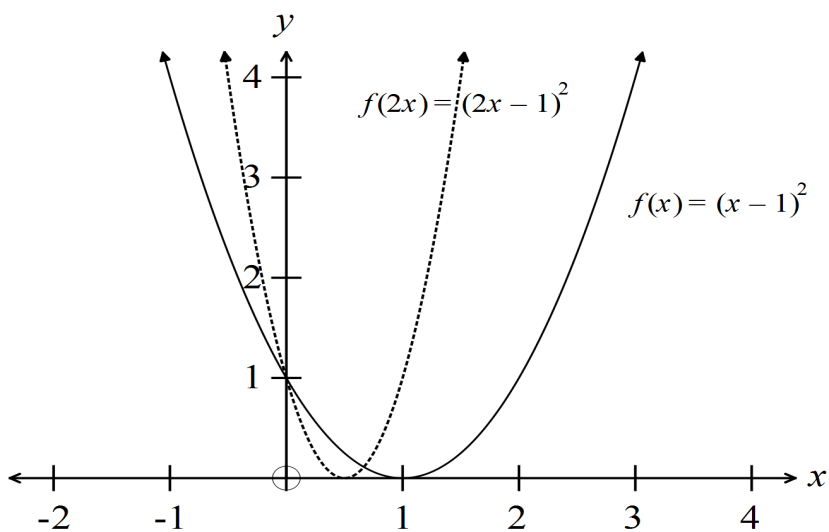
- Observations made from sketches should be verified using a calculator.
- Sketches should be accurate on key points e.g., intercepts and turning points
- Comment on the effect of k being negative rather than positive.
- Comment on the effect of the magnitude of k .

SUMMARY CHART

k	Transformation	Change to graph
2		
$\frac{1}{2}$		
-2		
$-\frac{1}{2}$		

Question 2

(9 marks)



Consider the graph of the functions $y = f(x) = (x - 1)^2$ and $y = f(2x) = (2x - 1)^2$

Note: If $y = f(kx)$ for $k = 2$ then $f(2x) = (2x - 1)^2$

The purpose of this activity is to

- investigate the dilation factor for the different values of k given below.
- investigate the turning point for the different values of k given below.

Determine the turning points and dilations of $y = f(kx)$ for $k = 2, 3, 10, 0.5$ and 0.25

Record your results in the table provided.

k	Turning point	Dilation factor
1		1
2		
3		
10		
0.5		
0.25		
m		

Throughout the next question you should

- focus on what happens to the X distances (x coordinate) for a given y coordinate.
- identify at least one point on each function by its coordinates and state the position of this point after it has been transformed.

Question 3

(34 marks)

Investigate the transformation $y = f(kx)$ for each of the functions

(i) $f(x) = \frac{1}{x}$

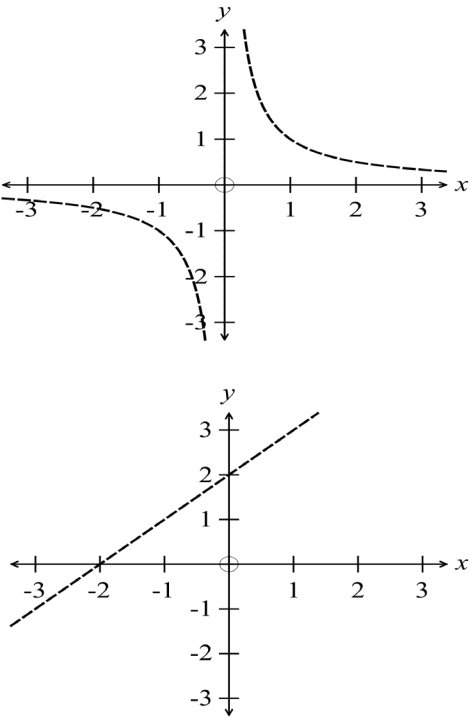
(ii) $f(x) = x + 2$

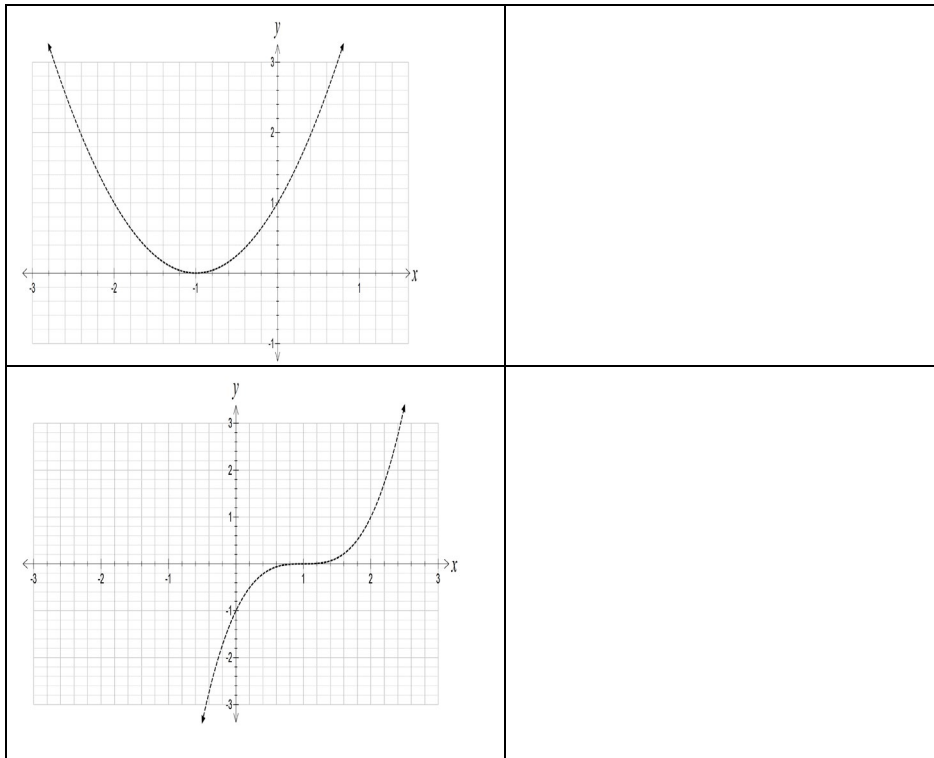
(iii) $f(x) = (x + 1)^2$

(iv) $f(x) = (x - 1)^3$

- (a) Consider a value of k such that $k > 1$ **and sketch** $y = f(kx)$ for each function onto the same axes where $y = f(x)$ is located. (4)

Summarise the effect of k on the graphs and on key points on the graphs (4)

Sketch transformed function: $k > 1$	Summary of the effect of k
	

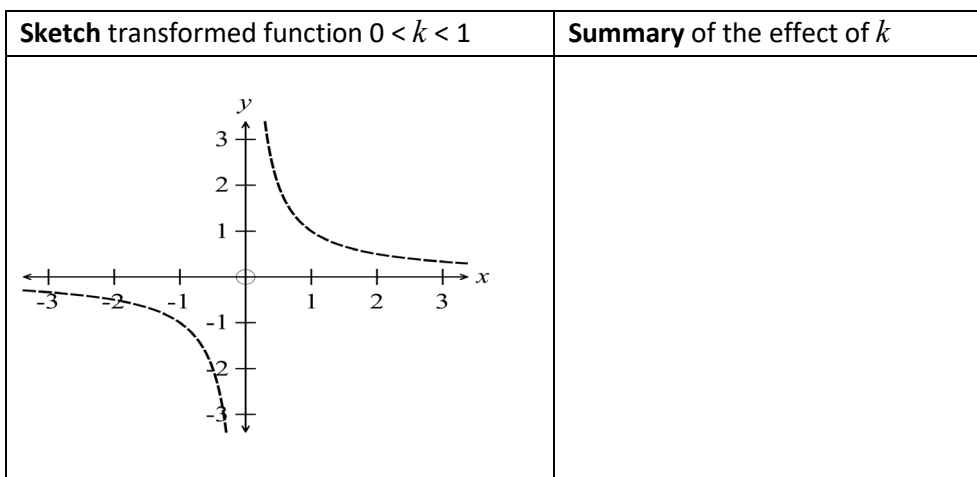


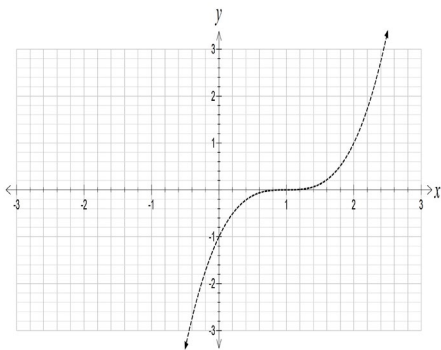
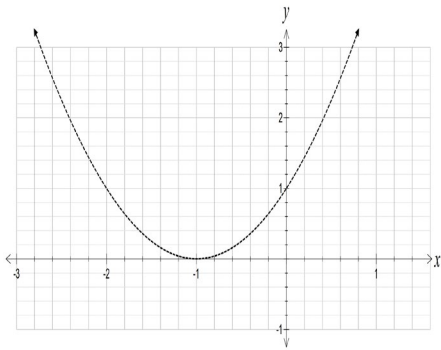
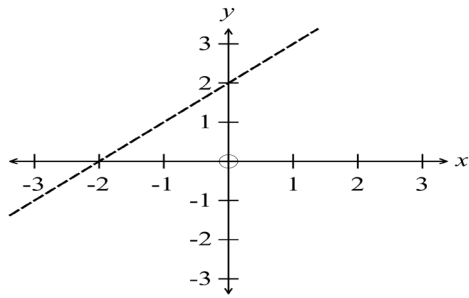
(b) Consider values of k such that $0 < k < 1$ and on the axes provided **sketch** $y = f(kx)$ for each of the functions: (4)

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

(iii) $f(x) = (x + 1)^2$ (iv) $f(x) = (x - 1)^3$

Summarise the effect of k on the graphs and on key points on the graphs. (4)



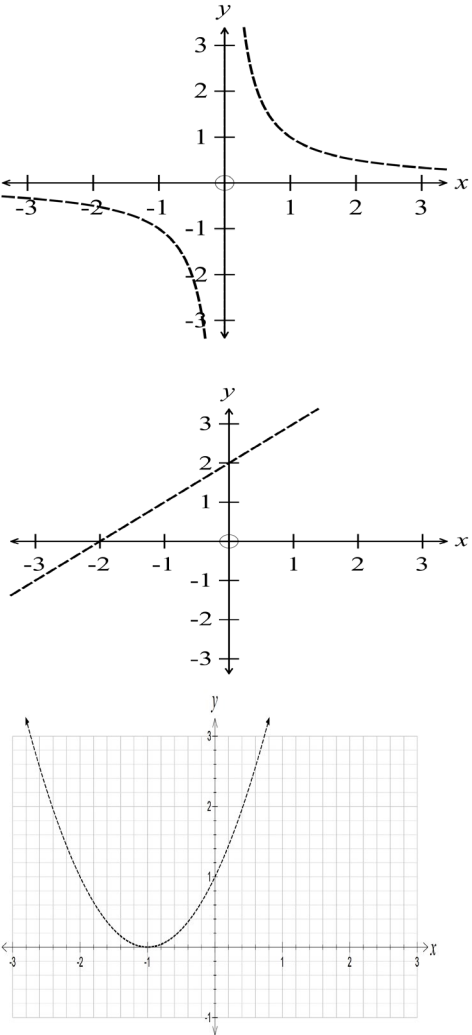


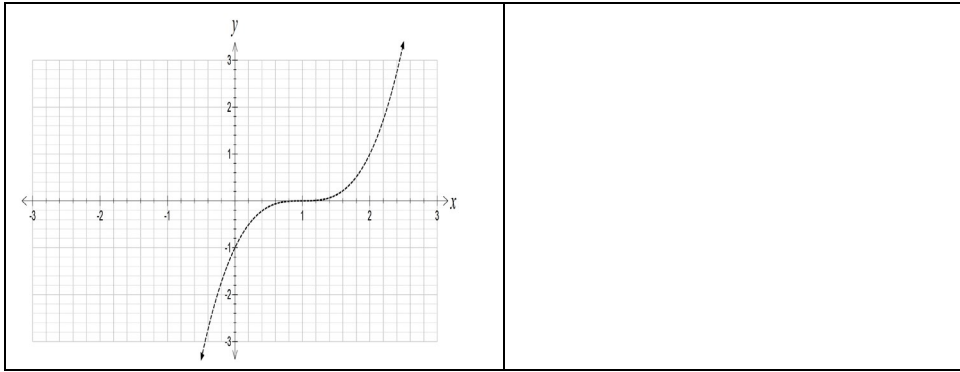
(c) Consider values of k such that $-1 < k < 0$ **and sketch** $y = f(kx)$ on the axes provided for each of the functions: (4)

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

(iii) $f(x) = (x + 1)^2$ (iv) $f(x) = (x - 1)^3$

Summarise the effect of k on the graphs and on key points on the graphs.....(5)

Sketch transformed function for $-1 < k < 0$	Summary of the effect of k
	



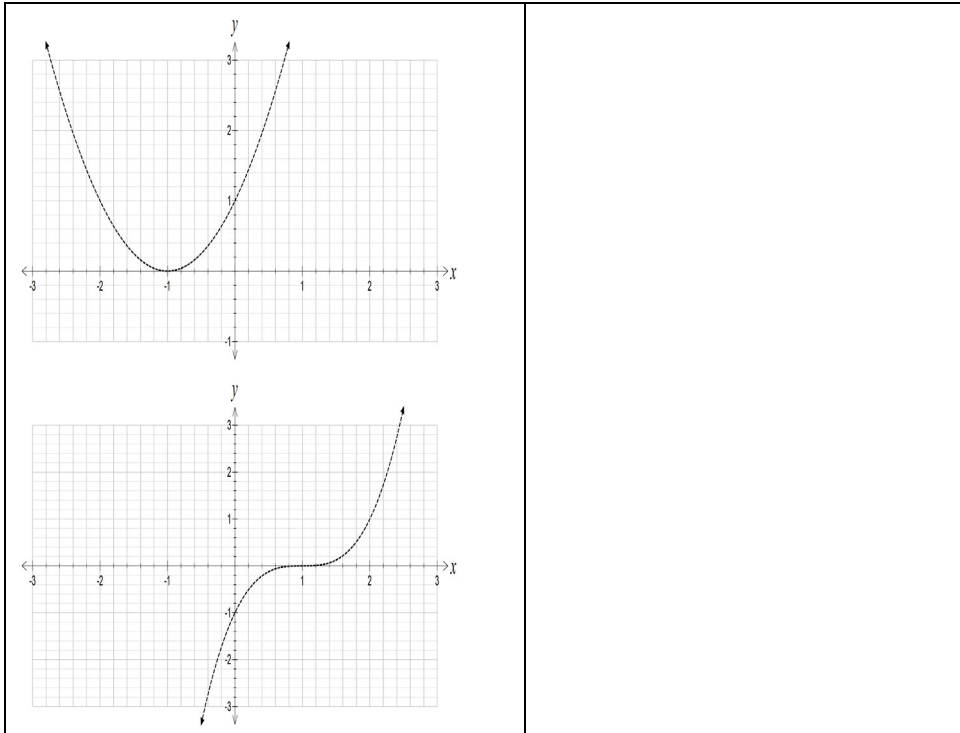
(d) Consider values of k such that $k < -1$ **and sketch** $y = f(kx)$ on the axes provided for each of the functions. (4)

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

(iii) $f(x) = (x+1)^2$ (iv) $f(x) = (x-1)^3$

Summarise the effect of k on the graphs and on key points on the graphs. (5)

Sketch transformed function: $k < -1$	Summary of the effect of k



End of Preparation Activity