



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Subject: Mathematics Advanced	Task Number: 1
Type of Task: Investigation	Coordinating Teacher: Rachel Waller Cooperating Teacher: Simone Parkinson, Kali Ratu Roraduri
Date Issued: 14 th March 2024, Term 1 Week 7	Date Due: 2nd April 2024 Term 1 Week 10
Total Marks: 150	Weighting: 30%

Submission Instructions: Students are to complete all sections of the assessment as per the instructions. Some sections of the task are hand-written. Students can either:

1. hand the task to the front office before 9am on the date allocated above on 2nd April 2024, or
2. scan and submit your assessment in the assessment submissions tab on MS teams prior to 9:00am on 2nd April, 2024.

Task Context:

In this topic, you have learned to use equations to graph functions.

In this task, you will investigate how the variables in the equation affect functions.

Syllabus Outcomes:

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, organise, model and interpret information in a range of contexts

MA11-9 provides reasoning to support conclusions which are appropriate to the context

Task Description:

Task 1: Investigating Graphs

- Using the Graphing Calculator, Desmos (<https://www.desmos.com/calculator>), you will investigate a number of different types of graphs and their translations and dilations. You will also investigate how these variations impact on the domain and range of the graph.
- Enter the equation as given in each heading and then use sliders to alter one variable at a time to observe its effect on the basic graph.
- Complete the information for each question.

Task 2: Algebraic Equations and Graphs

- You will be given a picture by your teacher to reproduce.
- Use the graphing calculator Desmos (link given above).
- Marks are allocated on likeness to the pattern displayed, matching the scale and listing the related equations.
- The final component is a free response where you produce an image of your own choosing. (Samples are given on page 31 and 32). A screen shot of the graph and equations will need to be included.



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Criteria for Assessing Learning

Students will be assessed on their ability to:

- Use technology to draw functions
- Accurately sketch functions from technology listing all important information
- Identify the features of a function
- Use functions to reproduce graphic designs
- Use functions to draw a design using technology
- Compares variables in equations.

HSC Key Verbs

Sketch (Draw): Represent a mathematical concept visually

Identify: Recognise and name

Compare: Show how things are similar or different

NESA "All My Own Work"

By signing for this assessment task and having completed the NESA course "All My Own Work" I confirm that this assessment task will be free from plagiarism and reflective of my own work. I understand that if I am found to have plagiarised or engaged in malpractice, I will be referred to the HT Access to engage the LAP Malpractice process.



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Marking Guidelines:

Description	Marks
Grade A	120-150
<p>Student:</p> <ul style="list-style-type: none"> • Graphs are drawn accurately and clearly, identifying all important information. • Accurate sketches of four different graphs drawn identifying all features. • Provides a concise explanation of how variables change using relevant terminology for all graphs. • Provides accurate and concise comparison. • Identifies accurately the similarities and differences between graphs. • Provides an accurate replica of the graph. • Provides correct equations with correct screenshot and scale. • An original accurate design is provided with 4 different types of functions. • Equations used are correct with a screen shot provided. 	
Grade B	90-120
<p>Student:</p> <ul style="list-style-type: none"> • Graphs are drawn clearly, identifying important information. • Sketches 4 different graphs drawn identifying all features. • Explain how variables change using relevant terminology for most graphs. • Provides a satisfactory comparison. • Identifies similarities and differences between graphs. • Provides a satisfactory replica of the graph, showing small errors. • Provides some correct equations with correct screenshot and scale. • An original design is provided with 3 different types of functions. • Equations used are mostly correct with a screen shot provided. 	
Grade C	60-90
<p>Student:</p> <ul style="list-style-type: none"> • Graphs are drawn, identifying most important information. • Sketches of 3 different graphs are drawn, identifying most features. • Attempts to explain how variables change using relevant terminology for some graphs. • An attempt to provide a comparison. • Attempts to identify similarities and differences between graphs. • Provides an attempt at the replica of the graph, with major errors. • Provides a few correct equations with correct screenshot or errors in scale. • An original design is provided with 2 different types of functions. • Some equations used are correct with a screen shot provided. 	



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Grade D	30-60
<p>Student:</p> <ul style="list-style-type: none">• Graphs are drawn, identifying some important information.• Sketches of 1 - 2 different graphs are drawn, identifying some features.• Basic attempts to explain how variables change using relevant terminology for a few graphs.• No comparisons provided.• No similarity or comparison provided.• Provides an attempt at the replica of the graph with an attempt at the correct scale.• No equations provided.• An original design is provided with 1 types of function.• No equation are included and screen shot provided.	
Grade E	0 - 30
<p>Student:</p> <ul style="list-style-type: none">• Graphs are drawn, identifying no important information.• Sketches of 1 graph are drawn with no features attempted.• Does not explain how variables change using relevant terminology for some graphs.• No comparisons provided.• No similarity or comparison provided.• No replicas of graph provided.• No original design and / or equations provided.	

Feedback: _____

Teacher Signature: _____ Date: _____





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ASSESSMENT TASK NOTIFICATION

Task 1: Investigating Graphs

LINEAR FUNCTIONS: $y = mx + c$

(24 marks)

1. Hand sketch the graph of $y = x$ below and complete the required details.

(9 marks)

	Equation: $y = x$
	Domain:
	Range:
	x-intercept/s:
	y-intercept:
	Symmetry:
	Odd/Even/Neither:
	Continuous or Discontinuous:

2. Using DESMOS, sketch at least 4 graphs in the form $y = mx + c$. Use positive and negative whole number values and fraction/decimal values for 'm' and 'c'. Include the graphs for each.

(8 marks – 2

marks per graph)

Print or sketch by hand the screenshot of the equations and graphs and include them in the space below. Ensure your screenshot is large enough to see all details clearly when printed. Hint: Make a graph a minimum of half a page.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



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ASSESSMENT TASK NOTIFICATION

3. Summarise how the value of ' m ' and ' c ' effects the shape, position, domain and range of the graph. (4 marks)

4. Describe how the graphs would be different for $y = b$ and $x = a$ and what effect does the value of ' a ' and ' b ' have in these cases. (3 marks)



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QUADRATIC FUNCTIONS: $y = a(x + h)^2 + k$

(21 marks)

1. Sketch the graph of $y = x^2$ below and complete the required details

(9 marks)

	Equation: $y = x^2$
	Domain:
	Range:
	x-intercept:
	y-intercept:
	Symmetry:
	Odd/Even/Neither:
	Continuous or Discontinuous:

2. Using DESMOS, sketch at least 4 graphs in the form $y = ax^2 + k$ or $y = (x + h)^2$. Use positive and negative whole number values and fraction/decimal values for 'a' and 'k'. Include the graphs for each.

(8 marks – 2 marks per graph)

Print or sketch the screenshot of the equations and graphs and include them in the space below. Ensure your screenshot is large enough to see all details clearly when printed. Hint: Make a graph a minimum of half a page.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

3. Summarise how the value of a , k and h effects the shape, position, domain and range of the graph. (4 marks)



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ASSESSMENT TASK NOTIFICATION

CUBIC FUNCTIONS: $y = a(x + h)^3 + k$

(20 marks)

1. Sketch the graph of $y = x^3$ below and complete the required details

(9 marks)

	Equation: $y = x^3$
	Domain:
	Range:
	x-intercept:
	y-intercept:
	Symmetry:
	Odd/Even/Neither:
	Continuous or Discontinuous:

2. Using DESMOS, sketch at least 4 graphs in the form $y = a(x + h)^3 + k$. Use positive and negative whole number values and fraction/decimal values for 'a', 'h' and 'k'. Include the graphs for each.

(8 marks – 2 marks per graph)

Print or sketch by hand the screenshot of the equations and graphs and include them in the space below. Ensure your screenshot is large enough to see all details clearly when printed. Hint: Make a graph a minimum of half a page.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

3. Summarise how the value of a, h and k effects the shape, position, domain and range of the graph.

(3

marks)





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ASSESSMENT TASK NOTIFICATION

THE HYPERBOLIC FUNCTION: $y = \frac{a}{x+h} + k$

(20 marks)

1. Sketch the graph of $y = \frac{1}{x}$ below and complete the required details

(9 marks)

	Equation: $y = \frac{1}{x}$
	Domain:
	Range:
	x-intercept:
	y-intercept:
	Symmetry:
	Odd/Even/Neither:
	Continuous or Discontinuous:

2. Using DESMOS, sketch at least 4 graphs in the form $y = \frac{a}{x+h} + k$. Use positive and negative whole number values and fraction/decimal values for 'a', 'h' and 'k'. Include the graphs for each.

(8 marks – 2 marks

per graph)

Print or sketch by hand the screenshot of the equations and graphs and include them in the space below. Ensure your screenshot is large enough to see all details clearly when printed. Hint: Make a graph a minimum of half a page.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



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ASSESSMENT TASK NOTIFICATION

3. Summarise how the value of a , h and k effects the shape, position, domain and range of the graph.

(3 marks)



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CIRCLE FUNCTIONS: $(x + h)^2 + (y + k)^2 = r^2$

(20 Marks)

1. Sketch the graph of $x^2 + y^2 = 1$ below and complete the required details.

(9 marks)

	Equation: $x^2 + y^2 = 1$
	Domain:
	Range:
	x-intercept:
	y-intercept:
	Symmetry:
	Odd/Even/Neither:
	Continuous or Discontinuous:

2. Using DESMOS, sketch at least 4 graphs in the form $(x + h)^2 + (y + k)^2 = r^2$

Include $r = \sqrt{(x + h)^2 + (y + k)^2}$ and $r = -\sqrt{(x + h)^2 + (y + k)^2}$

Use positive and negative whole number values and fraction/decimal values for 'h' and 'k'. Include the graphs for each.

(8 marks – 2 marks per graph)

Print or sketch by hand the screenshot of the equations and graphs and include them in the space below. Ensure your screenshot is large enough to see all details clearly when printed. Hint: Make a graph a minimum of half a page.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



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ASSESSMENT TASK NOTIFICATION

3. Summarise how the value of h and k effects the shape, position, domain and range of the graph.

(3

marks)



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ASSESSMENT TASK NOTIFICATION

ABSOLUTE VALUE FUNCTION: $y = a|x + h| + k$

(20 marks)

1. Sketch the graph of $y = |x|$ below and complete the required details.

(9 marks)

	Equation: $y = x $
	Domain:
	Range:
	x-intercept:
	y-intercept:
	Symmetry:
	Odd/Even/Neither:
	Continuous or Discontinuous:

2. Using DESMOS, sketch at least 4 graphs in the form $y = a|x + h| + k$. Use positive and negative whole number values and fraction/decimal values for 'a', 'h' and 'k'. Include the graphs for each.

(8 marks – 2 marks per graph)

Print or sketch by hand the screenshot of the equations and graphs and include them in the space below. Ensure your screenshot is large enough to see all details clearly when printed. Hint: Make a graph a minimum of half a page.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

Insert graph here.

Insert graph here.



LACHLAN ACCESS PROGRAM

ASSESSMENT TASK NOTIFICATION

3. Summarise how the value of a , h and k effects the shape, position, domain and range of the graph.

(3

marks)



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Overall Summary

(10 marks)

1. The value of m used in the linear graph equation is very similar to the value of a used in the equations of the other graphs. Do they have the same effect on each of the different graph types? Discuss in detail. (4 marks)

2. Similarly, the values of h and k are used in many of the equations for the different graph types. Do they have the same effect on each of the graphs? Discuss. (4 marks)





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3. Include any other similarities or differences you have noticed between the graphs during your investigation. (2 marks)



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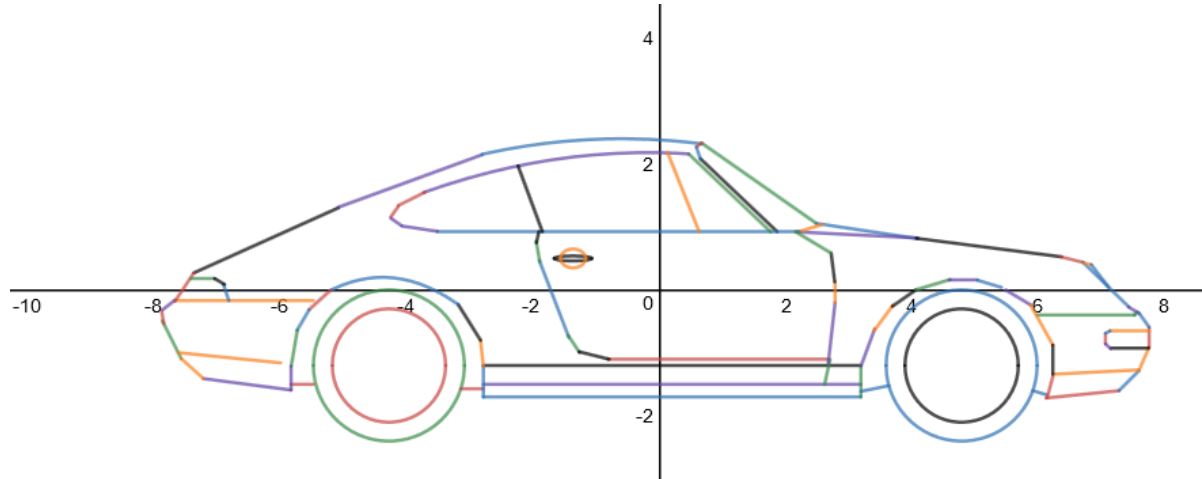
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Task 2: Algebraic Equations & Graphing

(15 marks)

Below are examples that have been drawn using equations

Sample <https://www.desmos.com/calculator/wzcgd04rgj>



Note- This is only a sample of the equations required for this image.

Wheels

$$\frac{(x - -4.3)^2}{.9^2} + \frac{(y - -1.2)^2}{.9^2} = 1$$

$$\frac{(x - 4.8)^2}{.9^2} + \frac{(y - -1.2)^2}{.9^2} = 1$$

$$\frac{(x - 4.8)^2}{1.2^2} + \frac{(y - -1.2)^2}{1.2^2} = 1$$

$$\frac{(x - -4.3)^2}{1.2^2} + \frac{(y - -1.2)^2}{1.2^2} = 1$$

MainBody

$$y = -1.57 \{ -3.158 \leq x \leq - \}$$

$$y = -.3x + .18 \{ 5.932 \leq x \leq \}$$

$$m = -0.3$$

$$b = 0.18$$

$$y = -1.7 \{ -2.8 < x < 3.2 \}$$

$$y = -1.2 \{ -2.8 < x < 3.2 \}$$

$$-1.5 \{ -2.8 < x < 3.2 \}$$

$$x = -2.8 \{ -1.7 < y < -1.2 \}$$

$$x = 3.2 \{ -1.7 < y < -1.2 \}$$

$$y = .45x + 3.6 \{ -7.4 \leq x \leq -5 \}$$

$$y = -.17 \{ -7.7 < x < -5.5 \}$$

$$y = -.4 \{ 6 < x < 7.55 \}$$

$$y = -1.5 \{ -5.855 < x < -5.5 \}$$

$$y = .8x + 6 \{ -7.9 \leq x \leq -7.7 \}$$

$$y = -2.001x - 16.3 \{ -7.9 \leq x \}$$



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Examples of Images which have been reproduced

	<ol style="list-style-type: none"> 1 $y = -x^2 + 10$ ✕ 2 $x^2 + (y - 8)^2 = .8$ ✕ 3 $(x + .3)^2 + (y - 8.4)^2 = .05$ ✕ 4 $(x - .3)^2 + (y - 8.4)^2 = .05$ ✕ 5 $y = x^2 + 7.5 \{-0.5 < x < 0.5\}$ ✕
	<ol style="list-style-type: none"> 1 $y = (x - 1)x(x + 1)(x - 2)(x + 2)$ 2



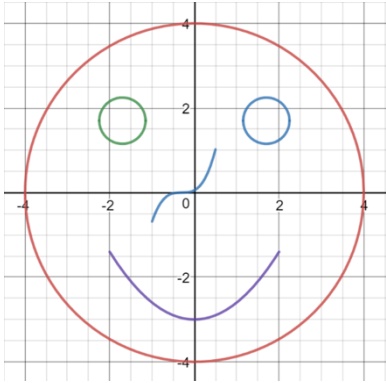
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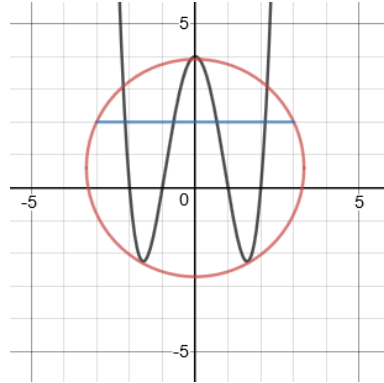
Part 1: Recreating an image

Your teacher will give you 1 of the following designs to recreate using equations on Desmos.

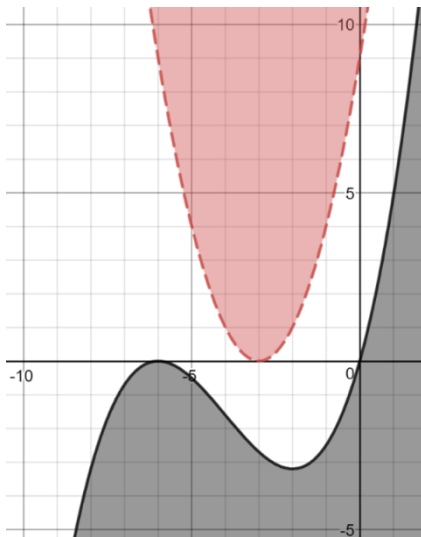
1.



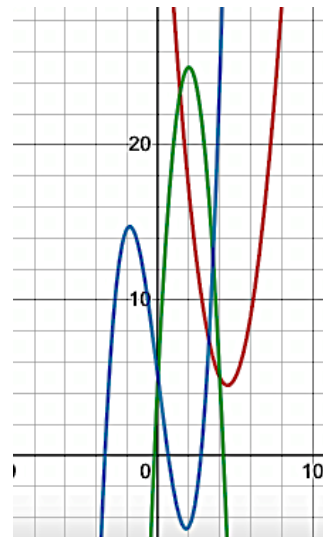
2.



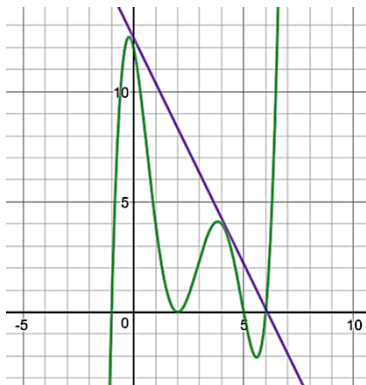
3.



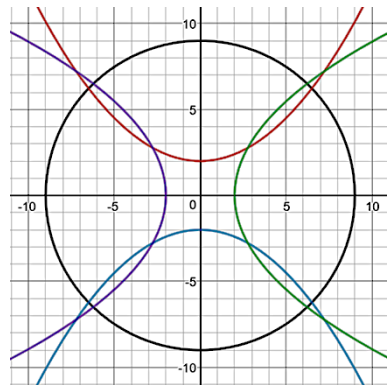
4.



5.



6.

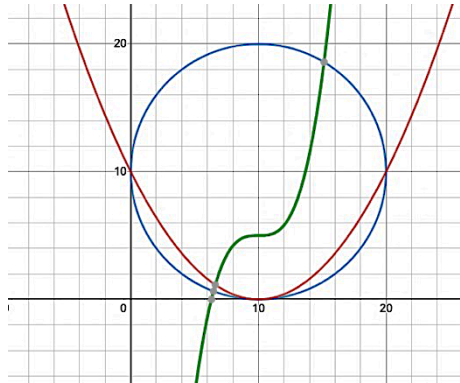




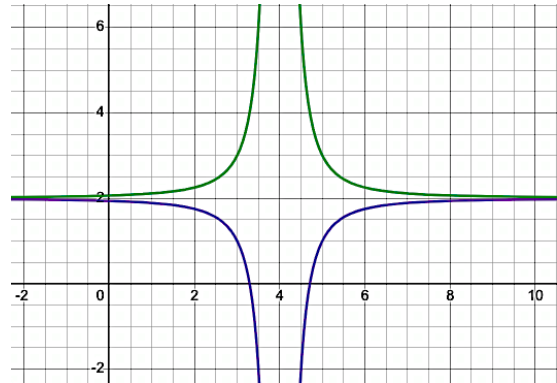
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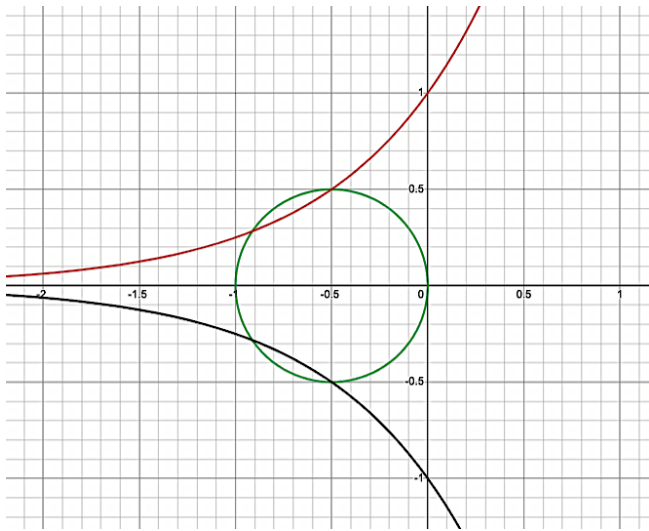
7.



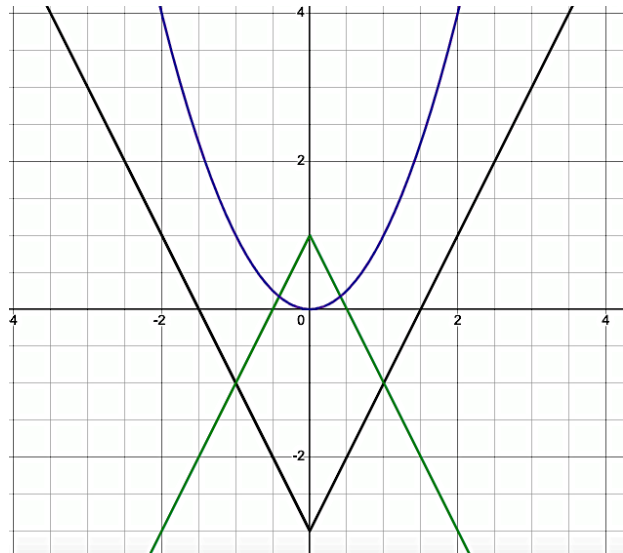
8.



9.



10.





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Part 1: Question Number: _____

(7 marks)

Using the picture given, design your picture in DESMOS. Insert a copy of your picture in the space below and write the equations you used to draw your shape in the space given.

Insert screenshot here.

Equations needed to draw your shape.



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Part 2: Free response drawing

(8 marks)

Use at least 5 different functions to design a picture of your own. Take a screenshot of the picture and write the equations needed to draw the picture.

Insert screenshot here.

Equations needed to draw your shape.