

Day 4, Lesson 2 – Quadratics: Graphs of Quadratic Relations

The following table outlines how you can accumulate points towards your portfolio from lesson 2

Final date for this Lesson work to be submitted is **Thursday, October 18**

Layer	Task	Task Notes	Points	Points Earned
HW Layer	Homework Completion	Pg41, provide graph and analysis (roots, vertex, A/S, y-intercept, opening) for Q15-20; & do Q21,22 Graphing should be done on GDC or other graphing program	15 points	
Common Tasks	Lesson Notes – We will work through these together in class	I will show one example of a graph of a quadratic and I will label the “analysis” features I want you to know.	5 points	
	Investigation	In this investigation, you will look at 5 features of the graphs of parabolas, namely: (i) the direction of opening, (ii) the axis of symmetry, (iii) the vertex (or maximum/minimum point), (iv) the x-intercepts (or roots/zeroes) and (v) the y-intercept Secondly, you will also look at three different formats of quadratic equations: standard $y = ax^2 + bx + c$, intercept form $y = a(x - R_1)(x - R_2)$, vertex form $y = a(x - h)^2 + k$ and compare/contrast their usefulness.	30 points	
	Assessment of the Investigation	Complete this assessment of the investigation you just finished by answering the 5 questions on the Assessment handout	5 points	
	Reflection	Answer one of the following 2 questions (1 paragraph). Choose the most appropriate one 1. What do you know now about quadratic graphs and quadratic equations that you did not know before this investigation? Be specific. 2. If you already knew all these anyway, did you make any new connections between the concepts you already knew? Be specific.	5 points	

“C” Layer Your work for each tasks includes the following: You have correctly completed the Investigation and the homework and compared conclusions and observations with another group. You have also completed the Consolidation Exercise. 15 points

Have the other group members place initials here:

“B” layer Your work for each tasks includes the following You have correctly completed the Investigation and the homework and compared conclusions and observations with another group. You have also completed the Consolidation Exercise. 15 points

Have the other group members place initials here:

An investigation into Inverse Functions Read through S4.5 (p146-148) in your text and explain to me what an inverse function is and how to graph one. 10 points

Alternative resources for the reading could be internet resources like:

(1) <http://www.purplemath.com>

(2)

http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra

Then complete p150, Q20,23

“A” Layer Your work for each tasks includes the following You have correctly completed the Investigation and the homework and compared conclusions and observations with another group. You have also completed the Consolidation Exercise. 15 points

Have the other group members place initials here:

Equations with Parameters Given the parabola $y = 3x^2 + bx - 2$, you will find: 20 points

(i) the axis of symmetry

(ii) the vertex

(iii) the x-intercepts

(iv) the y-intercept

(v) the direction of opening

Outline a way to solve this problem, then carry out your plan to the best of your ability!!

Solving Systems and Matrices If you are given 3 ordered pairs (-2,16), (1,10), (4,-32), you can determine the equation of the quadratic equation $y = ax^2 + bx + c$. Your textbook shows you how to do this algebraically (see Ex 1 on pg 44). BUT, you can also find the equation (the values of a,b,c) by the use of matrices. Find out how and report your findings to me. 5 points

Graphs of Quadratic Functions – An Investigation

In this investigation, you will look at 5 features of the graphs of parabolas, namely (i) the direction of opening, (ii) the axis of symmetry, (iii) the vertex (or maximum/minimum point), (iv) the x-intercepts (or roots/zeros) and (v) the y-intercept

Secondly, you will also look at three different formats of quadratic equations: standard $y = ax^2 + bx + c$, intercept form $y = a(x - R_1)(x - R_2)$, vertex form $y = a(x - h)^2 + k$ and compare/contrast their usefulness.

You will work with the following 8 quadratics for the entire investigation. Program them into your equation editor now.

Basic parabola	$y = x^2$	$y = -x^2$
Intercept form	$y = (x + 2)(x - 4)$	$y = -(x + 2)(x - 4)$
Standard form	$y = 4x^2 + 4x - 3$	$y = -4x^2 - 4x + 3$
Vertex form	$y = 0.5(x+1)^2 - 2$	$y = -0.5(x + 1)^2 + 2$

(A) Direction of Opening

Working with the 8 parabolas, look at the graph of each one and make a sketch of the general shape of each graph. Then make a statement about the direction of opening of each of the parabolas. Then make a conclusion to summarize. Your conclusion should answer the question → what is the relationship between each equation and the direction of opening of each of the parabolas?

Present your work in a neat, organized manner!

(B) Axis of Symmetry

Working only with the 4 parabolas that open upward, look at the graph of each one and make a sketch of the general shape of each graph. Then make a statement about where the axis of symmetry is located in each parabola. Then make a conclusion to summarize. Your conclusion should answer the question → what is the relationship between each equation and the axis of symmetry of each of the parabolas?

Present your work in a neat, organized manner!

(C) The Vertex (or Maximum or Minimum Point)

Working only with the 4 parabolas that open downward, look at the graph of each one and make a sketch of the general shape of each graph. Then make a statement about where the vertex is located in each parabola. Then make a conclusion to summarize. Your conclusion should answer the question → what is the relationship between each equation and the location of the vertex of each of the parabolas?

Present your work in a neat, organized manner!

(D) The x-intercepts (or roots or zeroes)

Working only with the 4 parabolas that open upward, look at the graph of each one and make a sketch of the general shape of each graph. Then make a statement about where the x-intercepts are located in each parabola. Then make a conclusion to summarize. Your conclusion should answer the question → what is the relationship between each equation and the location of the x-intercepts of each of the parabolas?

Present your work in a neat, organized manner!

(E) The y-intercept

Working only with the 4 parabolas that open downward, look at the graph of each one and make a sketch of the general shape of each graph. Then make a statement about where the y-intercepts are located in each parabola. Then make a conclusion to summarize. Your conclusion should answer the question → what is the relationship between each equation and the location of the y-intercepts of each of the parabolas?

Present your work in a neat, organized manner!

(F) General Conclusion About the Equation Format

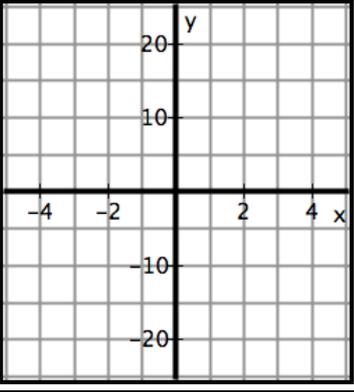
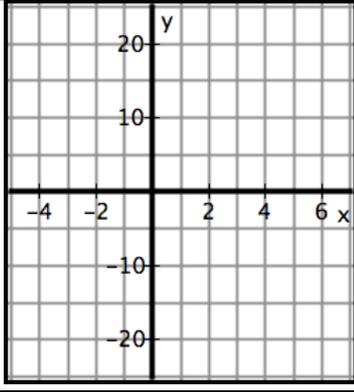
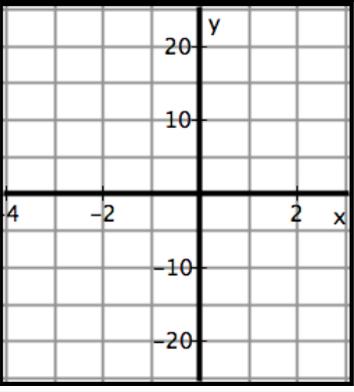
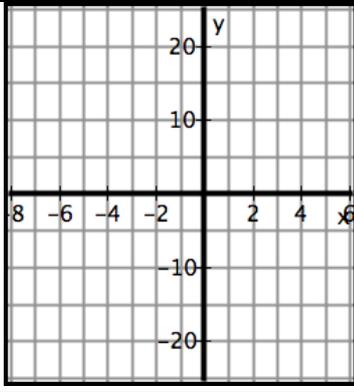
Answer the following question: Which form of the equation was the easiest to work with in order to identify and predict the locations of the

- i) the direction of opening
- ii) the axis of symmetry
- iii) the vertex
- iv) the x-intercepts
- v) the y-intercept

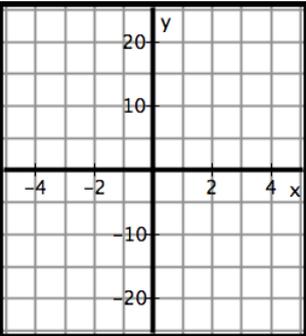
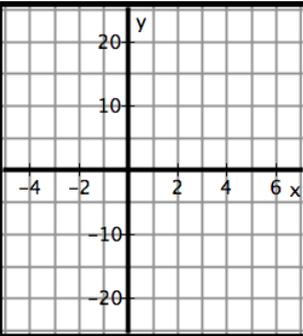
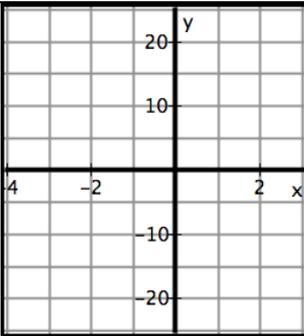
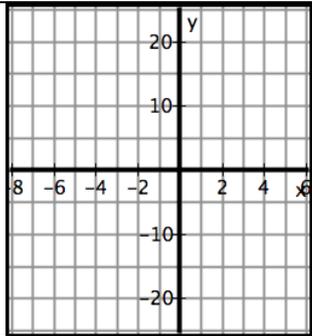
(G) Practice

Now get a sheet from Mr. S wherein you will practice identifying the locations of these features simply from the equation, without the use of a graphing calculator!!

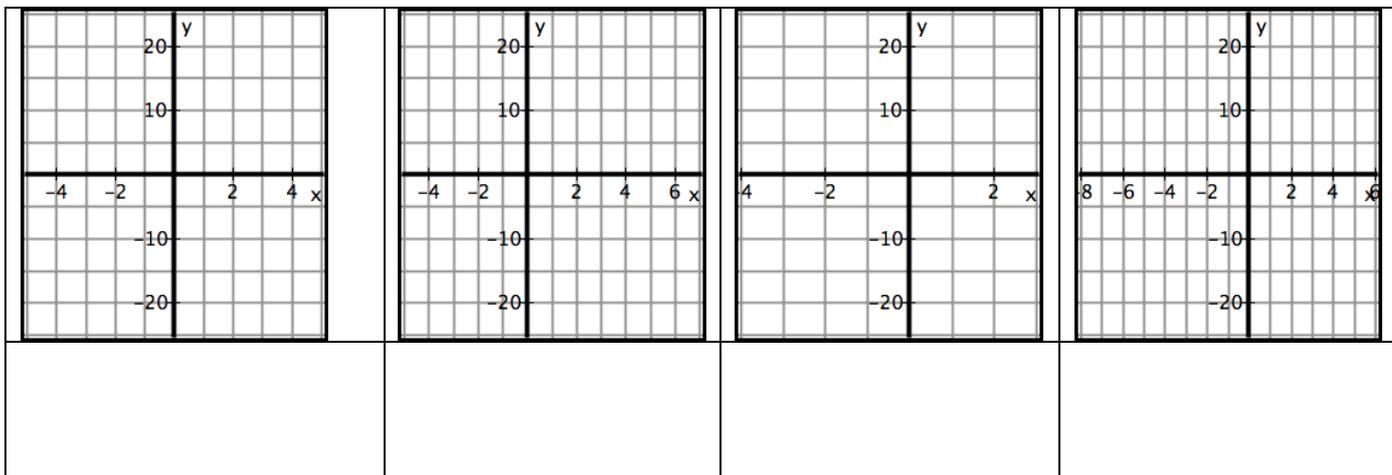
(A) Direction of Opening

<p>(a) </p>	<p>(b) </p>
<p>(c) </p>	<p>(d) </p>

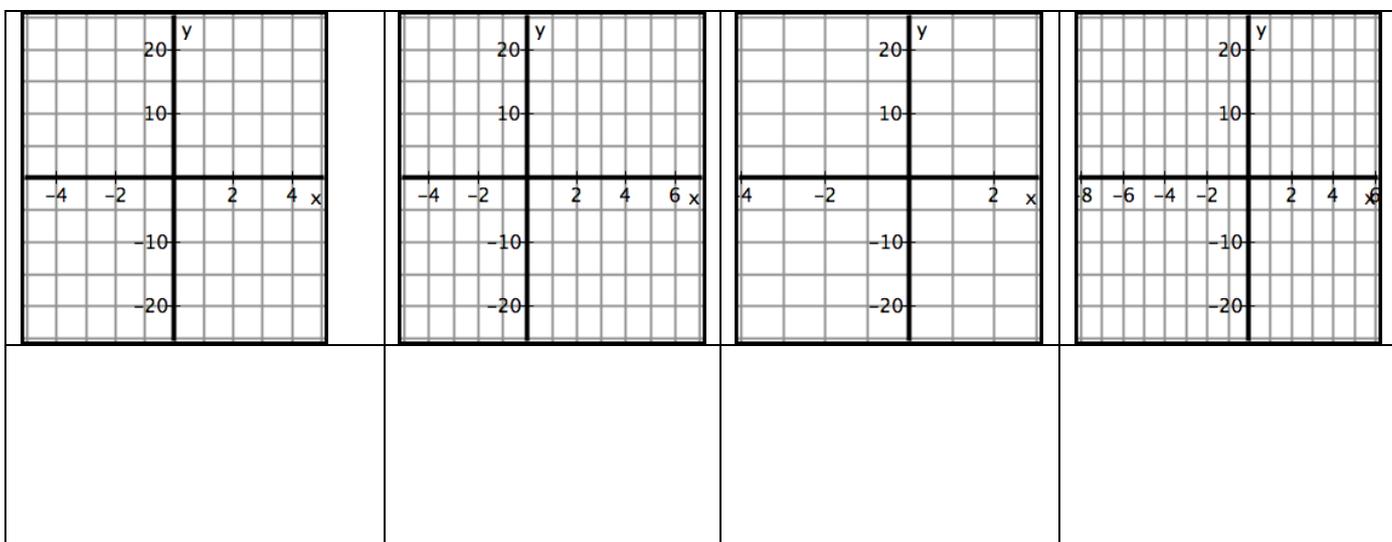
(B) Axis of Symmetry

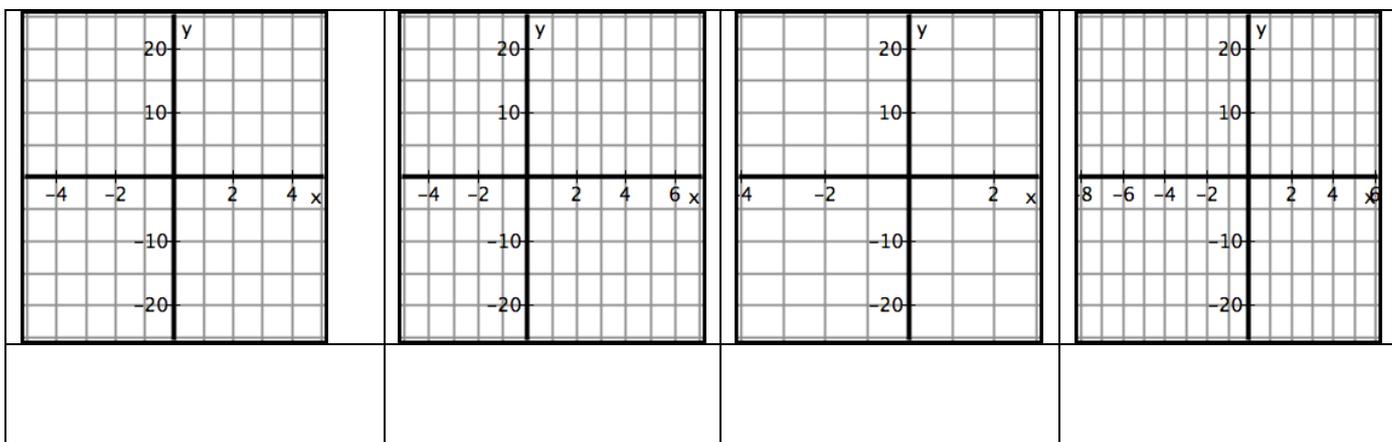
(C) The Vertex



(D) The x-intercepts

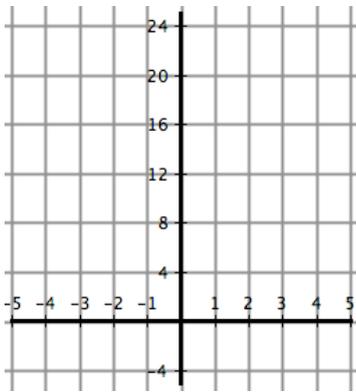
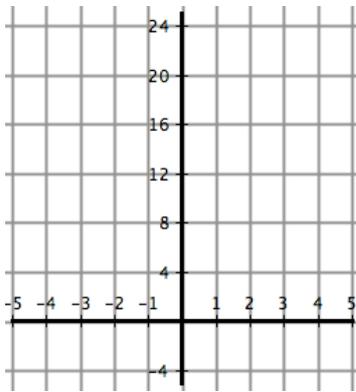
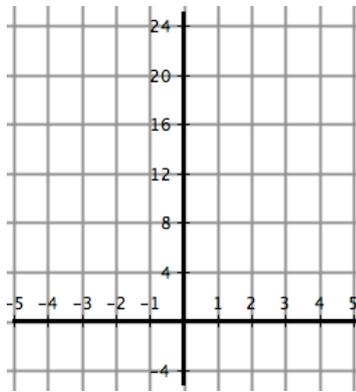


(E) The y-intercept



Consolidation Exercise

In this exercise, you will be addressing the connection between a quadratic equation and the graph of the corresponding parabola.

<p>Graph $f(x) = -2(x + 4)(x - 2)$ on the GDC.</p> <p>(a) sketch it on the grid provided (b) find the x-intercepts (c) find the vertex (d) find the axis of symmetry (e) find the y-intercept (f) find the direction of opening</p>	<p>Graph $f(x) = -2x^2 - 4x + 16$ on the GDC</p> <p>(a) sketch it on the grid provided (b) find the x-intercepts (c) find the vertex (d) find the axis of symmetry (e) find the y-intercept (f) find the direction of opening</p>	<p>Graph $f(x) = -2(x + 1)^2 + 18$ on the GDC.</p> <p>(a) sketch it on the grid provided (b) find the x-intercepts (c) find the vertex (d) find the axis of symmetry (e) find the y-intercept (f) find the direction of opening</p>
		

4. Graph all 3 graphs simultaneously on the same axes. What do you observe? What conclusion can you make about the 3 equations? Prove your conclusion!

Assessment of the Investigation:

Please complete this assessment of the investigation you just finished:

1. Were you able to understand all instructions (could you understand what you had to do?) What was clear and what was not clear. Be specific.
2. One intention of this investigation was to show you the 5 key features of the graphs of quadratics. Was the investigation successful in this intention? Why or why not?
3. A second intention of this investigation was to show you three different ways of writing a quadratic equation. Was the investigation successful in this intention? Why or why not?
4. A third purpose of this investigation was to show you that certain key features of the graph can easily be determined by simply considering the way the quadratic equation was written. Was the investigation successful in this intention? Why or why not?

A Moment of Reflection

Answer one of the following 2 questions. Choose the most appropriate one

1. What do you know now about quadratic graphs and quadratic equations that you did not know before this investigation? Be specific.

2. If you already knew all these anyway, did you make any new connections between concepts? Be specific.

“A” Layer Task

Given the parabola $y = 3x^2 + bx - 2$, you are required to find:

- (i) the axis of symmetry
- (ii) the vertex
- (iii) the x-intercepts
- (iv) the y-intercept
- (v) the direction of opening

Outline a way to solve this problem, then carry out your plan to the best of your ability!!