

(A) Lesson Context

BIG PICTURE of this UNIT:	- How do we analyze and then work with a data set that shows both increase and decrease - What is a parabola and what key features do they have that makes them useful in modeling applications - How do I use graphs, data tables and algebra to analyze quadratic equations?		
CONTEXT of this LESSON:	Where we've been In Lesson 1, you looked for number patterns & graphed in data from a variety of activities & in Lesson 2, you determined regression equations of quadratic data sets	Where we are What are the special features of the graphs of quadratic relations	Where we are heading How can I use graphs of quadratic relations to make predictions from quadratic data sets & quadratic models and quadratic equations

(B) Lesson Objectives:

- Generate graphs of quadratic relations on the TI-84 from given equations
- Introduce special features of these graphs – called parabolas
- Use the graphing calculator to analyse the parabolas and determine these special features
- Use the special features of the parabolas to answer contextual questions in quadratic modelling questions

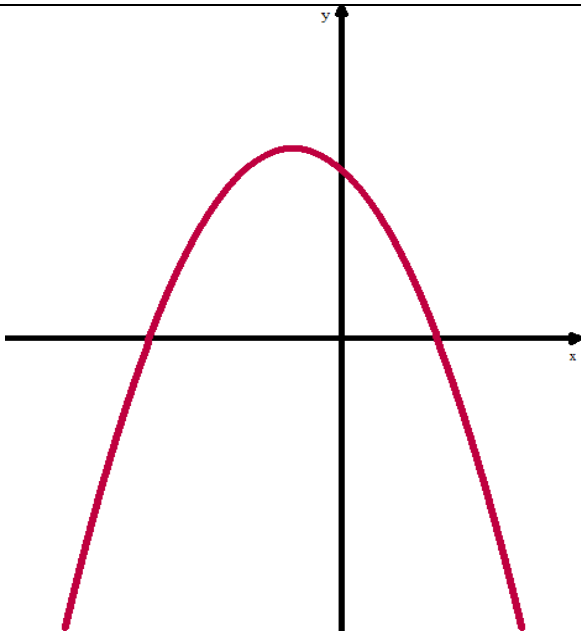
(C) KEY REVIEW POINTS → Main Point to Lesson 1

The KEY POINT to Lesson 1 was →

(D) KEY REVIEW POINTS → The TWO Main Points to Lesson 2

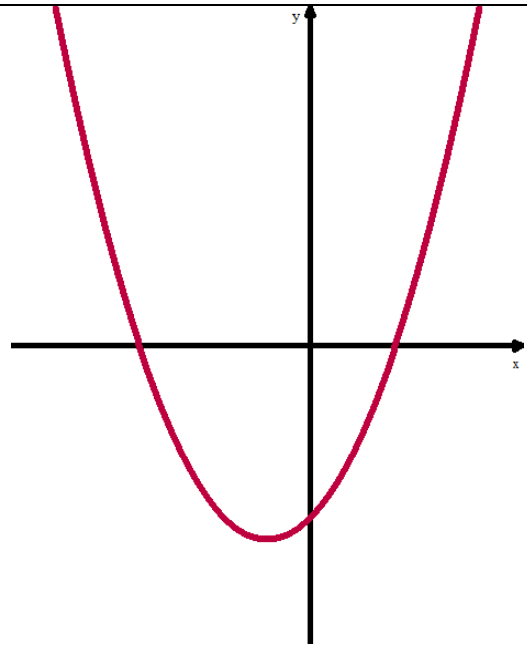
The FIRST KEY POINT to Lesson 2 was →

The SECOND KEY POINT to Lesson 2 was →

(E) Special Features of Parabolas

Define/describe/explain the following and label them on the diagram

- i)** Direction of opening
- ii)** Vertex/optimum point/Max or Min point
- iii)** Optimal value/max or min value
- iv)** Zeroes/x-intercepts
- v)** Y-intercept
- vi)** Axis of Symmetry

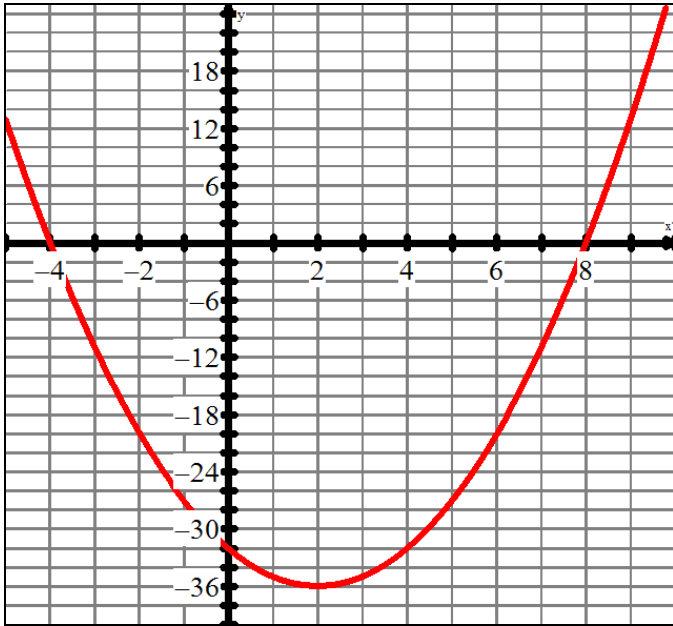


Define/describe/explain the following and label them on the diagram

- i)** Direction of opening
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- v)** Y-intercept
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(F) Special Features of Parabolas – From A GRAPH

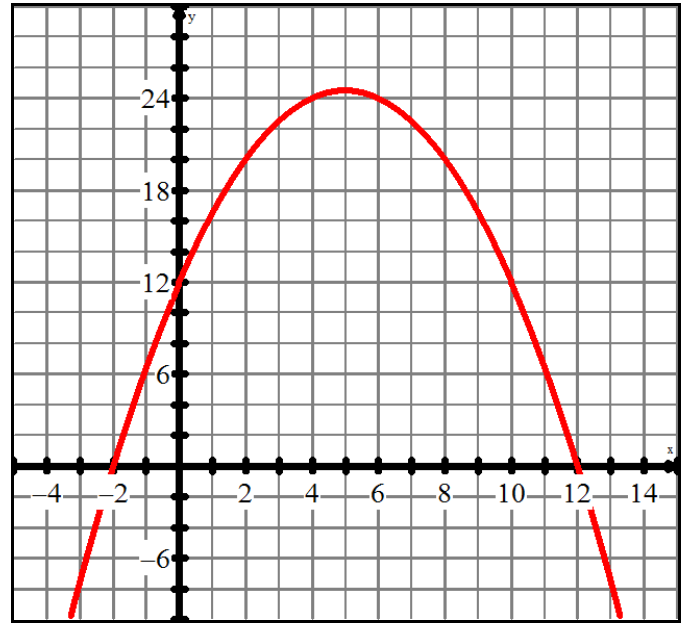
From the graph of the quadratic relation below, complete the required analysis:



- (a) Direction of opening
- (b) Vertex/optimum point/Max or Min POINT
- (c) Optimal value/max or min VALUE
- (d) Zeroes/x-intercepts
- (e) Y-intercept
- (f) Axis of Symmetry
- (g) Determine the value of y when $x = 3$
- (h) Determine the value of x when $y = -21$

EQUATION is $y = (x + 4)(x - 8)$

From the graph of the quadratic relation below, complete the required analysis:



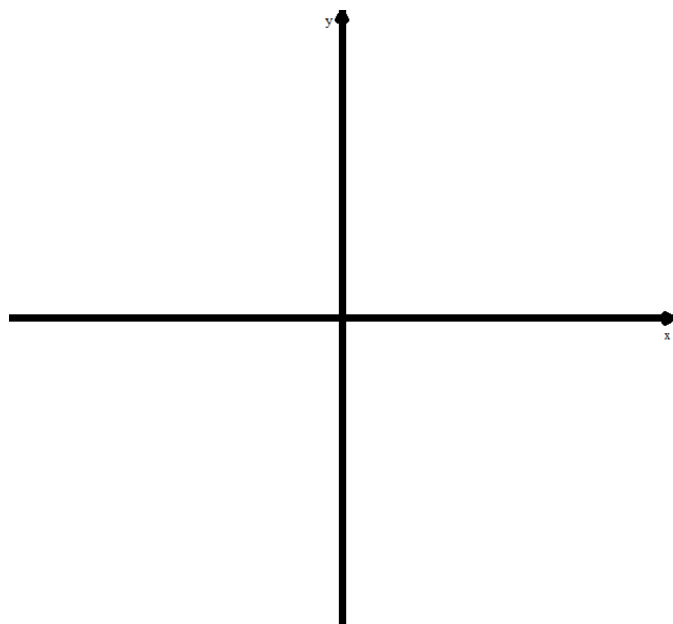
- (a) Direction of opening
- (b) Vertex/optimum point/Max or Min POINT
- (c) Optimal value/max or min VALUE
- (d) Zeroes/x-intercepts
- (e) Y-intercept
- (f) Axis of Symmetry
- (g) Determine the value of y when $x = 2$
- (h) Determine the value of x when $y = 6$

EQUATION is $y = -0.5x^2 + 5x + 12$

(G)Special Features of Parabolas – From an EQUATION & the TI-84

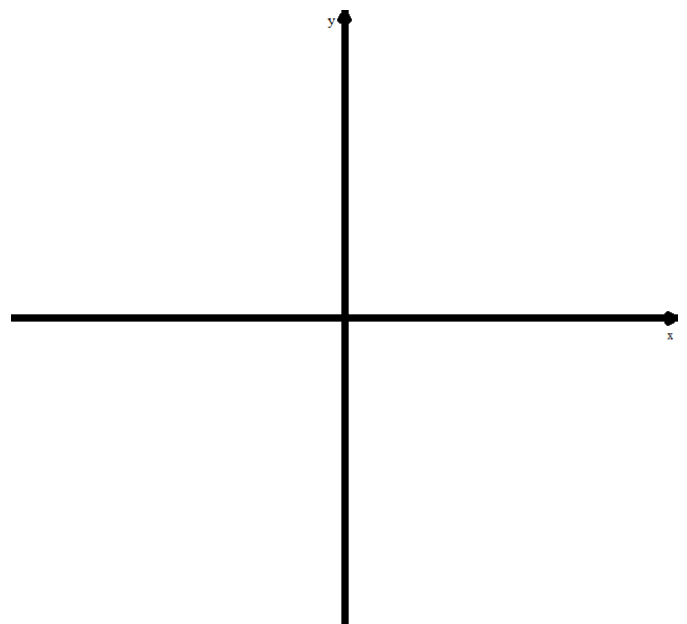
From the equation $y = 2x^2 - 12x - 32$, complete the required analysis:

- (a) Direction of opening
- (b) Vertex/optimum point/Max or Min **POINT**
- (c) Optimal value/max or min **VALUE**
- (d) Zeroes/x-intercepts
- (e) Y-intercept
- (f) Axis of Symmetry
- (g) Determine the value of y when $x = 1$
- (h) Determine the value of x when $y = -49.5$
- (i) Show a sketch with the key features labeled



From the equation $y = -0.25(x - 5)^2 + 4$, complete the required analysis:

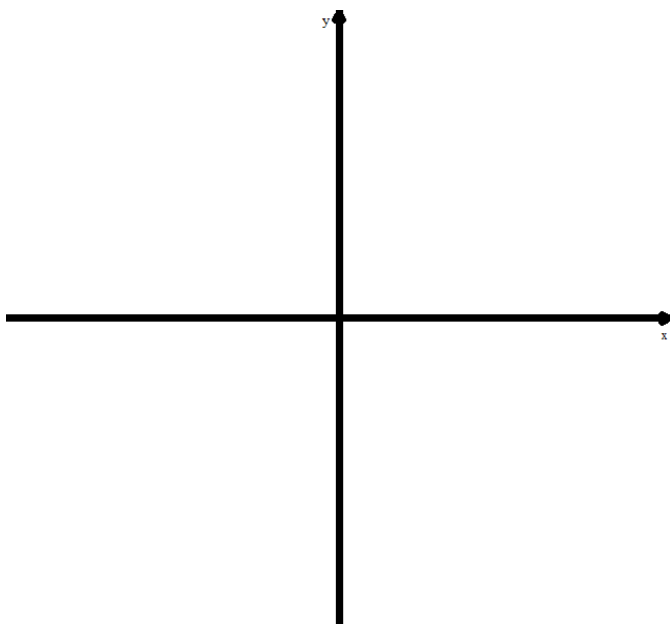
- (a) Direction of opening
- (b) Vertex/optimum point/Max or Min **POINT**
- (c) Optimal value/max or min **VALUE**
- (d) Zeroes/x-intercepts
- (e) Y-intercept
- (f) Axis of Symmetry
- (g) Determine the value of y when $x = -8$
- (h) Determine the value of x when $y = -12$
- (i) Show a sketch with the key features labeled.



(H)Special Features of Parabolas – From an EQUATION & the TI-84

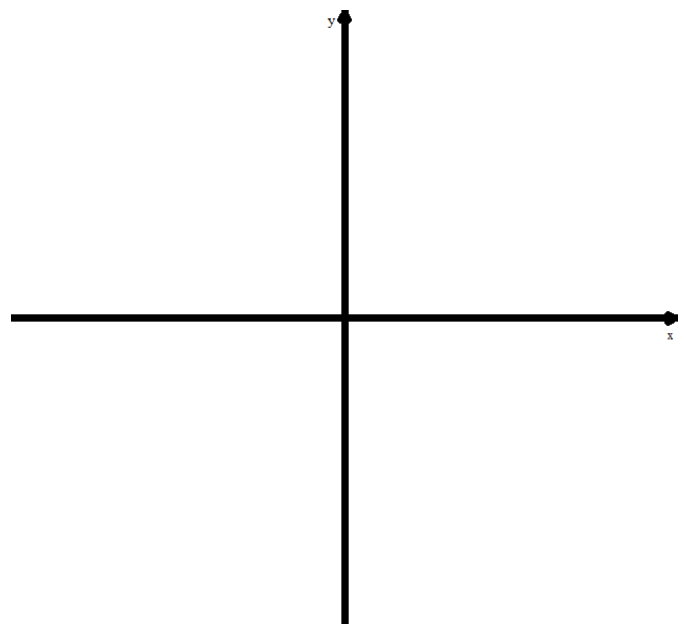
From the equation $y = -2(x + 4)(x - 7)$, complete the required analysis:

- (a) Direction of opening
- (b) Vertex/optimum point/Max or Min **POINT**
- (c) Optimal value/max or min **VALUE**
- (d) Zeroes/x-intercepts
- (e) Y-intercept
- (f) Axis of Symmetry
- (g) Determine the value of y when $x = 5.5$
- (h) Determine the value of x when $y = 30$



From the equation $y = 3x^2 + 10x - 5$, complete the required analysis:

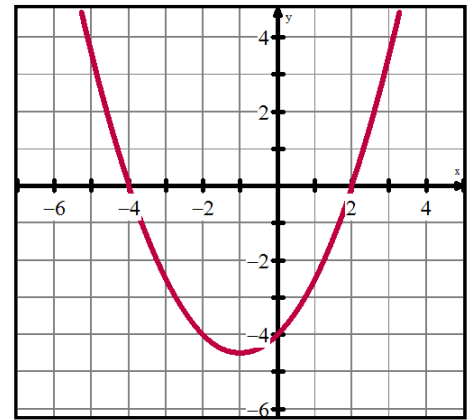
- (a) Direction of opening
- (b) Vertex/optimum point/Max or Min **POINT**
- (c) Optimal value/max or min **VALUE**
- (d) Zeroes/x-intercepts
- (e) Y-intercept
- (f) Axis of Symmetry
- (g) Determine the value of y when $x = -8$
- (h) Determine the value of x when $y = -12$



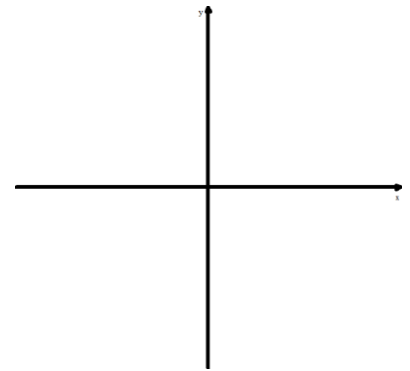
(I) Modelling with Quadratic Relations

Ex 1 → Examine the graph of the quadratic relation below:

- (i) What are the co-ordinates of the vertex?
- (ii) What is the optimal value?
- (iii) What is the equation of the axis of symmetry?
- (iv) What are the zeroes of the relation?
- (v) What would be the sign of the second differences?
- (vi) CHALLENGE: Determine the equation of this parabola.



- b) Ex 2 → Two parabolas each have zeroes of 1 and 11. One has a maximum value of 12, the other has a minimal value of -6. Sketch the 2 parabolas on the same axes.



- c) CONNECTION TO ALGEBRA → A relation is defined by the equation $A(L) = 24L - L^2$. For this relation:

- i) Write the equation in factored form by removing the GCF.
- ii) Determine the zeros.
- iii) State the equation of the axis of symmetry.
- iv) Graph it on the GDC and determine the optimal value.
- v) Sketch the parabola, labeling the key features

