Characteristics of Quadratic Relations

Key Concepts:
- vertex
- zeroes
  - where are they?
  - how many? 0, 1, or 2
- axis of symmetry
- direction of opening
- optimal value
  - maximum or minimum?

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Characteristics of Quadratic Relations
(see handout)

The vertex is the highest or lowest point on the parabola, and we refer to its coordinates as (h, k).

The axis of symmetry is the vertical line passing through the vertex, having the equation x = h.

If the parabola opens up, the coefficient of x^2 is positive ($\Delta^2 y > 0$)
- the vertex is the lowest point
- the minimum (or optimum) value is k

If the parabola opens down, the coefficient of x^2 is negative ($\Delta^2 y < 0$):
- the vertex is the highest point
- the maximum (or optimum) value is k

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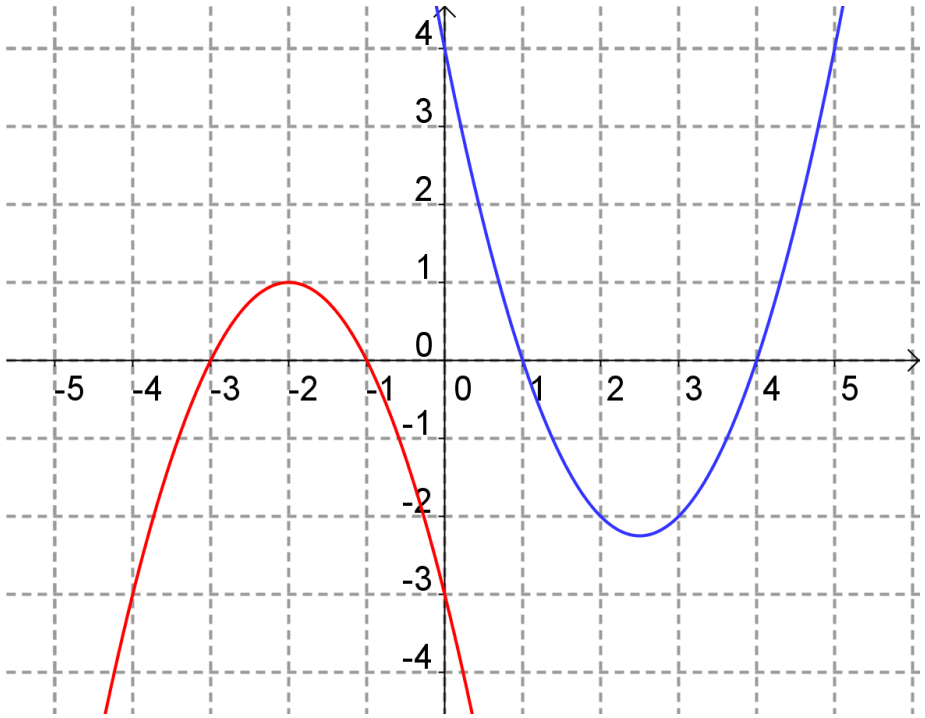
Consider the two graphs shown:



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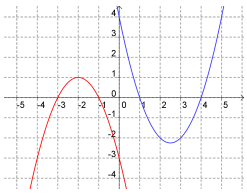
Ex.1. Consider the two graphs:

Can you deduce values for each of the following?



Property	$y = -x^2 - 4x - 3$	$y = x^2 - 5x + 4$
Direction of Opening		
Maximum or Minimum		
Number of Zeroes		
Axis of Symmetry		
max/min value		
Location of Vertex		
Location of Zeroes		
y-intercept		

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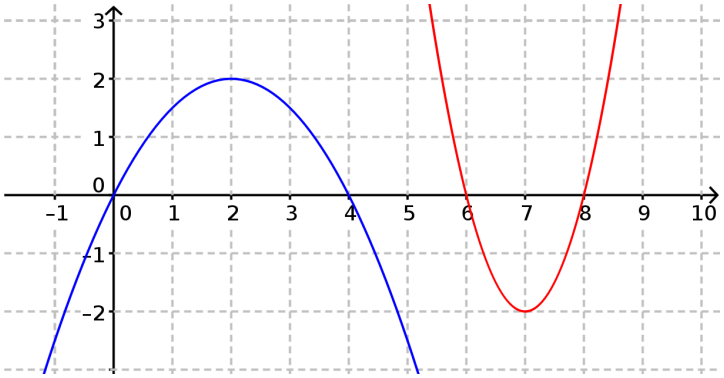
If the parabola crosses the x-axis, the x-coordinates of the crossing points are called the zeroes, or roots, or x-intercepts.

A parabola may have two zeros:



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Or one zero:

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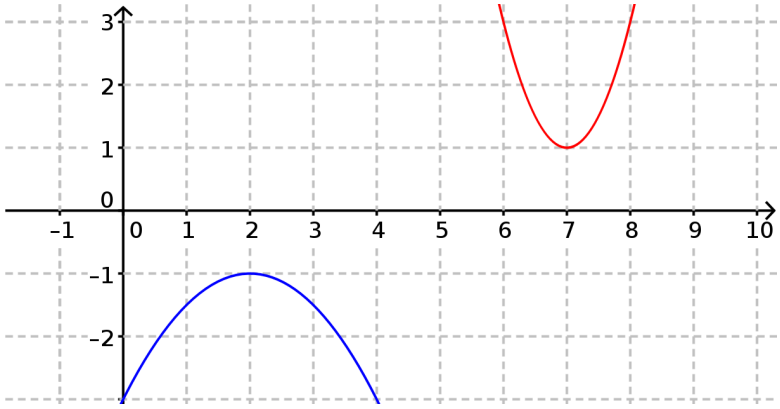
Or no zeroes:



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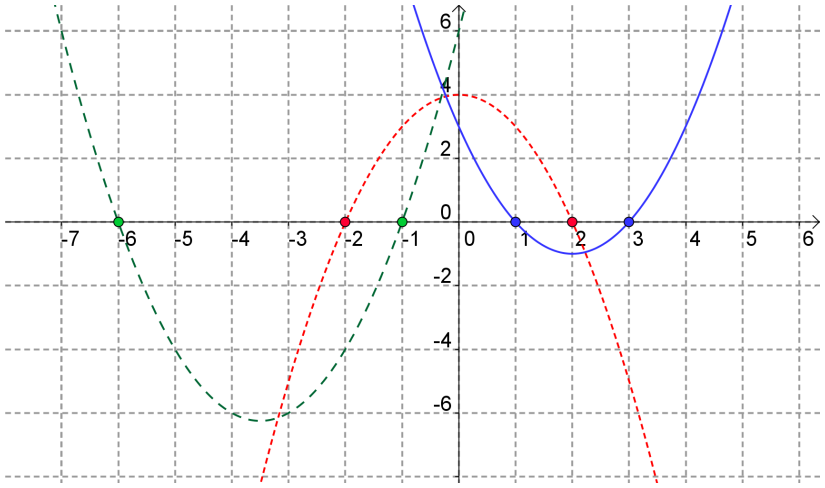
Ex. From the graphs, determine key features of each.

$y = x^2 - 4x + 3$ $y = -x^2 + 4$ $y = x^2 + 7x + 6$



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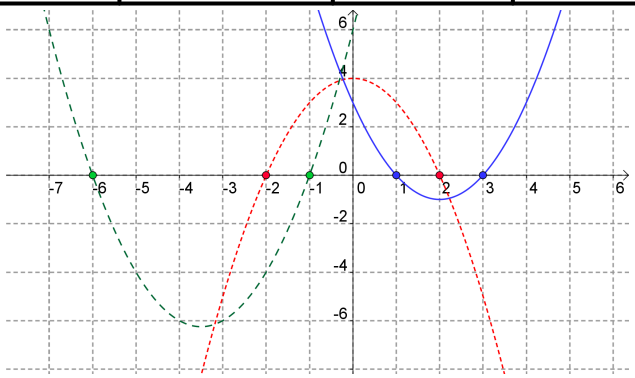
$y = x^2 - 4x + 3$ $y = -x^2 + 4$ $y = x^2 + 7x + 6$

vertex			
opening			
max/min?			
max/min value			
y-intercept			
zeroes			
axis of symmetry			



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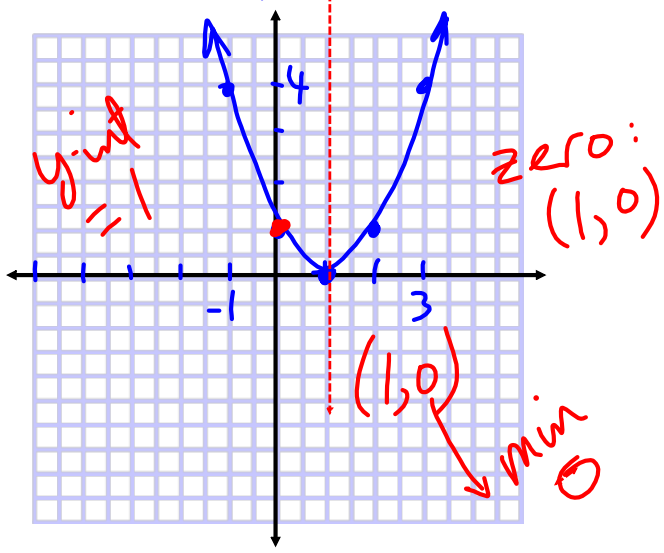
Assigned Work:

p. 145 # 1-6, 7ef, 9ab

7(e) $y = x^2 - 2x + 1$

x	y
-1	4
0	1
1	0
2	1
3	4



9(b)

$$x_{MP} = \frac{x_1 + x_2}{2}$$

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