

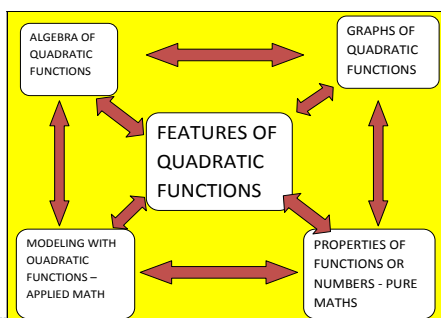
## Lesson 15 – Graphs of Quadratic Functions

Math 2 Honors - Santowski

### Lesson Objectives

- ▶ Study the various features of functions that apply to quadratic functions
- ▶ Prepare and analyze graphs by hand and by technology

### BIG PICTURE



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### (A) Key Terms related to Quadratic. Fcns

- ▶ 1. Domain, Range
- ▶ 2. roots, zeroes, x-intercepts
- ▶ 3. y-intercept & symmetry point
- ▶ 4. vertex, extrema, turning point
- ▶ 5. maximum/minimum point/value on infinite domains or on a set interval
- ▶ 6. intervals of increase/decrease

### (B) Example #1 (CI)

- ▶ For the QF  $f(x) = 2x^2 - 2x - 60$ , identify the:
  - ▶ 1. Domain, Range
  - ▶ 2. roots, zeroes, x-intercepts
  - ▶ 3. y-intercept & symmetry point
  - ▶ 4. maximum/minimum point/value on an infinite domain and on a set domain of  $[-4,5]$
  - ▶ 5. intervals of increase/decrease
- ▶ 6. Sketch the parabola
- ▶ 7. Re-express the quadratic function in factored form and in vertex form

▶

### (B) Example #2 (CA)

- ▶ For the QF  $f(x) = 3x^2 - 30x + 1$ , identify the:
  - ▶ 1. Domain, Range
  - ▶ 2. roots, zeroes, x-intercepts
  - ▶ 3. y-intercept & symmetry point
  - ▶ 4. maximum/minimum point/value on an infinite domain and on a set domain of  $[-4,5]$
  - ▶ 5. intervals of increase/decrease
- ▶ 6. Sketch the parabola
- ▶ 7. Re-express the quadratic function in factored form and in vertex form

▶

**(B) Example #3 (CI)**

- ▶ For the QF  $f(x) = -\frac{1}{2}(x - 4)(x - 10)$ , identify the:
  - ▶ 1. Domain, Range
  - ▶ 2. roots, zeroes, x-intercepts
  - ▶ 3. y-intercept & symmetry point
  - ▶ 4. maximum/minimum point/value on an infinite domain and on a set domain of  $[-4,5]$
  - ▶ 5. intervals of increase/decrease
- ▶ 6. Sketch the parabola
- ▶ 7. Re-express the quadratic function in standard form and in vertex form

**(B) Example #4 (CA)**

- ▶ For the QF  $f(x) = 3(3 - x)(2x + 5)$ , identify the:
  - ▶ 1. Domain, Range
  - ▶ 2. roots, zeroes, x-intercepts
  - ▶ 3. y-intercept & symmetry point
  - ▶ 4. maximum/minimum point/value on an infinite domain and on a set domain of  $[-4,5]$
  - ▶ 5. intervals of increase/decrease
- ▶ 6. Sketch the parabola
- ▶ 7. Re-express the quadratic function in standard form and in vertex form

**(B) Example #5 (CI)**

- ▶ For the QF  $f(x) = 2(x + 4)^2 - 6$ , identify the:
  - ▶ 1. Domain, Range
  - ▶ 2. roots, zeroes, x-intercepts
  - ▶ 3. y-intercept & symmetry point
  - ▶ 4. maximum/minimum point/value on an infinite domain and on a set domain of  $[-4,5]$
  - ▶ 5. intervals of increase/decrease
  - ▶ 6. The transformations of the base function  $y = x^2$
- ▶ 7. Sketch the parabola
- ▶ 8. Re-express the quadratic function in standard form and in factored form

**(B) Example #6 (CA)**

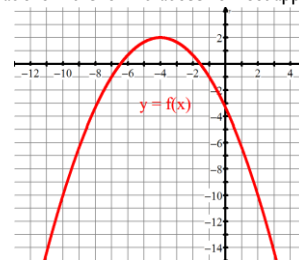
- ▶ For the QF  $f(x) = -\frac{1}{4}(6 - 4x)^2 + 2$ , identify the:
  - ▶ 1. Domain, Range
  - ▶ 2. roots, zeroes, x-intercepts
  - ▶ 3. y-intercept & symmetry point
  - ▶ 4. maximum/minimum point/value
  - ▶ 5. intervals of increase/decrease on an infinite domain and on a set domain of  $[-4,5]$
  - ▶ 6. The transformations of the base function  $y = x^2$
- ▶ 7. Sketch the parabola
- ▶ 8. Re-express the quadratic function in standard form and in factored form

**Examples**

- ▶ (8) What is the graphical significance of a perfect square trinomial?
- ▶ (9) What is the graphical significance a difference of squares trinomial?

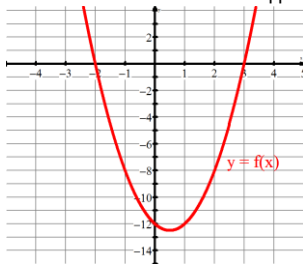
**Example 10**

- ▶ Here are some graphs of quadratic functions → determine their equations in the form that seems most appropriate to you.



### Example 11

- ▶ Here are some graphs of quadratic functions → determine their equations in the form that seems most appropriate to you.

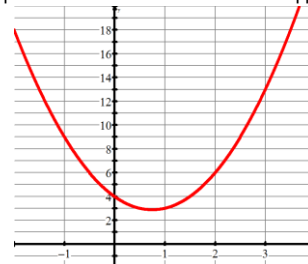


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### Example 12

- ▶ Here are some graphs of quadratic functions → determine their equations in the form that seems most appropriate to you.



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### Example 13

- ▶ (1) Write the equation of the parabola that has zeroes of  $-3$  and  $2$  and passes through the point  $(4, 5)$ .
- ▶ (2) Write the equation of the parabola that has a vertex at  $(4, -3)$  and passes through  $(2, -15)$ .
- ▶ (3) Write the equation of the parabola that has a  $y$ -intercept of  $-2$  and passes through the points  $(1, 0)$  and  $(-2, 12)$ .

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### Examples

- ▶ 14. Use technology to graphically solve:  
 $2x^2 + x - 2 = 4 - 3x$
- ▶ 15. Use technology to graphically solve:  
 $3x^2 + 12x + 4 \leq 2x + 5$
- ▶ 16. Use technology to graphically solve:  
 $x^2 + 2x - 2 = -x^2 + 3x + 5$
- ▶ 17. Use technology to graphically solve:  
 $2x^2 - 5x + 1 > 4 - 3x + \frac{1}{2}x^2$

### (B) Example

- ▶ 18. How many solutions would you predict for the solution to  $x^2 + 4x - 1 = \frac{1}{2}x^2 - x + 3$ . Discuss the relevance of  $a$  and the  $a$ 's in your answer.
- ▶ 19. How many solutions would you predict for the solution to  $-\frac{1}{2}(x + 3)(x - 1) = -2(x + 3)^2 - 2$ . Discuss the relevance of the various obvious features in your predictions.

▶