

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY  
MTE 9 – FUNCTIONS, QUADRATIC EQUATIONS AND PARABOLAS (1 cr.)

**Course Description**

Includes an introduction to functions in ordered pair, graph, and equation form. Also introduces quadratic functions, their properties and their graphs. Credit is not applicable toward graduation. Lecture 1 hour per week.1 credit.

**General Course Purpose**

The purpose of this course is to develop competency necessary to succeed in selected 100-level math courses in solving applications using functions, quadratic functions and their properties.

**Course Prerequisites/Corequisites**

Prerequisite: MTE 8 or qualifying placement score

**Course Objectives**

Upon completing the course, students will be able to:

- 9.1 Determine if a relation is a function and identify the domain and range of the function.**
- 9.1.1 Determine if a list of ordered pairs, graph, or equation is a function.
  - 9.1.2 Determine the domain and range of a function given as a list of ordered pairs.
  - 9.1.3 Determine the domain and range of a function given as a graph.
  - 9.1.4 Determine the domain of a function given as an equation.
  - 9.1.5 Evaluate  $y = f(x)$  for constant values of  $x$  and for specific monomials and binomials.
- 9.2 Find all roots of quadratic equations using both the square root method and the quadratic formula.**
- 9.2.1 Find the roots of quadratic equations of the form  $ax^2 + c = 0$ .
  - 9.2.2 Find the roots of quadratic equations of the form  $ax^2 + bx + c = 0$  when the discriminant is a positive perfect square, (i.e. the quadratic is factorable).
  - 9.2.3 Find the roots of quadratic equations of the form  $ax^2 + bx + c = 0$  when the discriminant is positive, but not a perfect square.
  - 9.2.4 Find the roots of quadratic equations of the form  $ax^2 + bx + c = 0$  when the discriminant is zero.
  - 9.2.5 Find the roots of quadratic equations of the form  $ax^2 + bx + c = 0$  when the discriminant is negative.
  - 9.2.6 Describe the roots of a quadratic based upon the discriminant in all cases.
- 9.3 Analyze a quadratic function to determine its vertex by completing the square and using the formula.**
- 9.3.1 Write a quadratic function in vertex form  $y = a(x - h)^2 + k$  by completing the square for quadratics with  $a = 1$ , and identify the vertex  $(h, k)$ .
  - 9.3.2 Write a quadratic function in vertex form  $y = a(x - h)^2 + k$  by completing the square for quadratics with  $a \neq 1$ , and identify the vertex  $(h, k)$ .
  - 9.3.3 Find the vertex of a quadratic equation  $y = ax^2 + bx + c$  using the formula method  $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ .

- 9.4 Graph a quadratic function, using the vertex form, indicating the intercepts and vertex.**
- 9.4.1 Determine whether the parabola opens upward or downward.
  - 9.4.2 Plot the vertex of the parabola.
  - 9.4.3 Determine the axis of symmetry for the parabola.
  - 9.4.4 Plot the  $x$ -intercepts of the parabola, if they exist.
  - 9.4.5 Plot the  $y$ -intercept of the parabola and complete the graph with additional points as needed.
- 9.5 Apply knowledge of quadratic functions to solve application problems from geometry, economics, applied physics, and other disciplines.**
- 9.5.1 Solve problems involving area optimization.
  - 9.5.2 Solve problems involving revenue optimization.
  - 9.5.3 Solve problems involving the motion of falling objects.

### **Major Topics to be Included**

- 9.1 Determine if a relation is a function and identify the domain and range of the function.
- 9.2 Find all roots of quadratic equations using both the square root method and the quadratic formula.
- 9.3 Analyze a quadratic function to determine its vertex by completing the square and using the formula.
- 9.4 Graph a quadratic function, using the vertex form, indicating the intercepts and vertex.
- 9.5 Apply knowledge of quadratic functions to solve application problems from geometry, economics, applied physics, and other disciplines.