

**J. Sargeant Reynolds Community College**  
**Course Content Summary**

**Course Prefix and Number:** MTE 9

**Credits:** 1

**Course Title:** Functions, Quadratic Equations, and Parabolas

**Course Description:** Includes an introduction to functions in ordered pair, graph, and equation form. Also introduces quadratic functions, their properties and their graphs. Credits not applicable toward graduation. Prerequisite: placement recommendation or MTE 8. Lecture 4 hours per week for ¼ semester.

**General Course Purpose:** This course is designed to introduce the student to functions and quadratics and to give them tools for understanding their properties.

**Course Prerequisites and Co-requisites:**

Prerequisite: placement recommendation or MTE 8

**Student Learning Outcomes:**

Upon completing the course, the student will be able to

- a. Determine if a list of ordered pairs, graph, or equation is a function;
- b. Determine the domain and range of a function given as a list of ordered pairs;
- c. Determine the domain and range of a function given as a graph or an equation;
- d. Evaluate  $y = f(x)$  for constant values of  $x$  and for specific monomials and binomials;
- e. Find the roots of quadratic equations of the form  $ax^2 + c = 0$ ;
- f. Find the roots of quadratic equations of the form  $ax^2 + bx + c = 0$  when the discriminant is a positive perfect square, positive but not perfect square, zero, or negative;
- g. Describe the roots of a quadratic based upon the discriminant in all cases;
- h. Write a quadratic function in vertex form  $y = a(x - h)^2 + k$  by completing the square for quadratics;
- i. Find the vertex of a quadratic equation  $y = ax^2 + bx + c$  using the formula method  $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ ;
- j. Determine whether the parabola opens upward or downward;
- k. Plot the vertex of the parabola;
- l. Determine the axis of symmetry for the parabola;
- m. Plot the  $x$ - and  $y$ - intercepts of the parabola and complete the graph with additional points as needed;
- n. Solve problems involving area optimization;
- o. Solve problems involving revenue optimization; and
- p. Solve problems involving the motion of falling objects.

**Major Topics to Be Included:**

- a. Functions
- b. Domain and range
- c. Roots of quadratics
- d. Features of parabolas
- e. Vertex form of quadratics
- f. Applications from geometry, economics, applied physics and other disciplines

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