

**What is in this Handout:** This handout contains information related to MATH 123 College Algebra. Its purpose is to help you make an informed decision about which course in the Algebra-Precalculus-Calculus sequence is right for you at Framingham State. Below you will find a general overview of the MATH 123 College Algebra course and its catalog description, as well as the related co-requisite mathematics lab. The next page provides a set of competency exercises that could typically appear in a MATH 123 College Algebra course. Students who feel confident in their ability to complete a *majority* of these exercises may wish to learn more about the subsequent MATH 180 Precalculus course, to best determine their appropriate starting point in the Algebra-Precalculus-Calculus sequence.

**General Overview:** The MATH 123 College Algebra course typically begins with a quick review of linear equations/inequalities and systems of linear equations, where solving systems using matrix methods can also be introduced. Eventually functions are introduced (evaluating, solving, function arithmetic, domain and range). Several classic examples of functions and their graphs are used ( $|x|$ ,  $x^2$ ,  $x^3$ ,  $\sqrt{x}$ ,  $\sqrt[3]{x}$ ,  $\frac{1}{x}$ , and  $\sqrt{r^2 - x^2}$ ) to emphasize the various essential aspects of a function, before transitioning to more advanced function concepts (function arithmetic, compositions, finding domain algebraically, inverses, transformations, and piecewise-defined functions). A primary focus throughout much of the course is on developing a thorough understanding of polynomial functions, especially quadratics, and their respective graphs. Being able to accurately analyze and create a detailed graph a variety of algebraic functions is an essential outcome of the course. The course typically concludes with a treatment of rational functions, which are explored in more depth early on in the MATH 180 Precalculus course.

Catalog Description: An exploration of numerical, graphical, and symbolic approaches to algebraic concepts with emphasis on real-world applications, modeling, and problem-solving skills. Topics include polynomials, rational expressions, equations and inequalities, systems of linear equations, matrices, and the connection between functions and their graphs.

**Co-requisite Lab:** Depending on a student's high school transcripts and mathematics placement prior to matriculating, a co-requisite mathematics lab may be required at the time of enrollment in MATH 123 College Algebra. Mathematics labs are intended to provide students with an opportunity to develop and master the essential foundational skills necessary for successful completion of the course. Lab structure and requirements, as well as concepts covered in during lab can vary by instructor, but typically will include: working with fractions, prime factorizations, identifying a greatest common factor or least common multiple of two numbers, simplifying square roots, factoring polynomial expressions, properties of exponents, etc. Even if a student's background does not required them to enroll in the mathematics lab, all students are generally encouraged to review their course's related (prerequisite) lab content to insure their success in the course.

Catalog Description: A co-requisite two-hour mathematics lab providing just-in-time remediation for students who are under-prepared in math. Students must be enrolled in a corresponding credit-bearing mathematics course and are required to attend this weekly faculty-led math lab. Attendance and assignments are incorporated into the final grade of lecture course. Note: This is a non-credit course.

All accompanying graphs should have a clearly defined scale and identify any important aspects, if they exist (vertex,  $y$ -intercept,  $x$ -intercept(s), horizontal and vertical asymptotes).

- Factor and find all real roots of the expression  $-30x^4 + 15x^3 - 12x^2 + 6x$ .
- Let  $f(x) = x^2 - 6x + 3$ . Complete the following.
  - Find the vertex form of  $f$ .
  - Find  $f(0)$  and solve  $f(x) = 0$ .
  - Provide a complete sketch of the graph of  $f$ .
- Let  $f(x) = \sqrt{x} - 13$ ,  $g(x) = 7x^2 + 29x + 30$ , and  $h(x) = \frac{1}{x}$ .
  - Find and simplify  $(g \circ f)(9)$  and  $(f/h)\left(\frac{1}{4}\right)$ .
  - Identify the domains of both  $f \circ g$  and  $h \circ g$ . Express each of your answers using interval notation.
- Solve the following inequality. Express your answer using interval notation.

$$8 - 3|5x - 3| \leq 2$$

- Two cars start from the same point and travel in opposite directions. After three hours, they are 195 miles apart. If car A travels 15 miles per hour faster than car B, how fast are the two cars traveling?

$$6. \text{ Let } g(x) = \begin{cases} -x^2 + 16, & x < 3 \\ x + 16, & x \geq 3 \end{cases} . \text{ Complete the following.}$$

- Evaluate  $g$  at  $x = 3$  and  $x = -3$ .
  - Find all real roots of  $g$ .
- Let  $g(x) = -\frac{1}{6}(x - 4)^2(2x + 3)$ . Complete the following.
    - Find  $g(0)$  and solve  $g(x) = 0$ .
    - Describe the end behavior of the graph of  $g$ :

$$\text{As } x \rightarrow \infty, g(x) \rightarrow \underline{\hspace{2cm}}.$$

$$\text{As } x \rightarrow -\infty, g(x) \rightarrow \underline{\hspace{2cm}}.$$

- Sketch a graph of  $g$ .
- Apply polynomial division to the following expression and identify your remainder.

$$\frac{x^3 - 26x - 45}{x + 4}$$

- Let  $f(x) = \frac{2 - x}{x - 4}$ . Complete the following.
  - Find  $f(0)$  and solve  $f(x) = 0$ .
  - Identify any vertical and horizontal asymptotes on the graph of  $f$ .
  - Sketch a graph of  $f$ .
  - Find the inverse function  $f^{-1}(x)$ .
  - Identify the domain and range of  $f$ .