MATH 223 **Massasoit Community College**
Calculus III

Description: This is a third course in the calculus sequence intended for undergraduate mathematics, science, technology, or engineering majors. Topics include conic sections, parametric equations, polar coordinates, vectors and applications, functions of several variables, partial derivatives and applications, double and triple integrals in rectangular and other coordinate systems and applications, vector fields, line integrals and applications, parametric surfaces, surface integrals and applications, Green's Theorem, the Divergence Theorem, and Stokes's Theorem.

Prerequisite: C- or higher in MATH 222 Calculus II; waiver by placement testing results; or departmental approval.

COURSE OUTCOMES	**SAMPLE OUTCOMES ACTIVITIES**	**SAMPLE ASSESSMENT TOOLS**
Upon successful completion of this course students should:	To achieve these outcomes students may engage in the following activities:	Student learning may be assessed by:
1. Demonstrate an understanding of conic sections, plane curves, and parametric equations to solve application problems; (QL)	☐ Identify and find equations of ellipses, parabolas, and hyperbolas ☐ Sketch curves represented by parametric equations ☐ Write the rectangular equation of a curve by eliminating the parameter ☐ Represent curves using parametric equations ☐ Solve slope, tangent line, arc length, and area problems for parametric curves	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams

2. Demonstrate an understanding of vectors; (QL)	☐ Write vectors, perform basic vector operations, and represent vectors graphically ☐ Calculate dot products and cross products, and solve application problems ☐ Sketch plane and space curves, perform basic calculus operations, and solve motion, tangent/normal vector, arc length, and curvature problems involving vector-valued functions	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams
3. Demonstrate an understanding of functions of multiple variables; (QL)	☐ Plot points in three-dimensional space ☐ Find equations of lines and planes in space ☐ Write equations of surfaces in space and sketch their graphs ☐ Calculate limits and establish continuity of multivariate functions	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams
4. Demonstrate an understanding of partial derivatives and their applications; (QL)	☐ Find partial derivatives of multivariate functions ☐ Construct and use chain rules for functions of multivariate functions ☐ Calculate directional derivatives, gradients, tangent planes, and normal lines ☐ Find relative and absolute extrema for functions of two variables	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams
5. Demonstrate an understanding of non-rectangular coordinate systems (QL)	☐ Perform conversions from rectangular coordinates to polar coordinates in two dimensions and to cylindrical and spherical coordinates in three dimensions ☐ Sketch polar graphs, calculate areas of polar regions, and calculate arc lengths of polar curves ☐ Plot points in cylindrical and spherical coordinates	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams

6. Demonstrate an understanding of multiple integrals; (QL)	☐ Set up and evaluate double and triple integrals in rectangular coordinates ☐ Reverse the order of integration of a double integral ☐ Set up and evaluate double integrals in polar coordinates ☐ Set up and evaluate triple integrals in cylindrical and spherical coordinates ☐ Calculate volumes and solve other applications using double and triple integrals ☐ Use change of variables and the Jacobian to evaluate double integrals	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams
7. Demonstrate an understanding of vector fields and line integrals; (QL)	☐ Sketch vector fields ☐ Write and evaluate line integrals and solve application problems ☐ Identify conservative vector fields, calculate potential functions, and use the Fundamental Theorem of Line Integrals ☐ Use Green's Theorem to evaluate line integrals	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams
8. Demonstrate an understanding of parametric surface and surface integrals; (QL)	☐ Find a set of parametric equations to represent a surface and sketch the surface ☐ Write and calculate surface integrals and solve application problems ☐ Use the Divergence Theorem to evaluate surface integrals ☐ Use Stokes's Theorem to understand the connection between surface integrals and line integrals	☐ Homework ☐ In-class problem sets ☐ Quizzes ☐ Exams