

# EASTERN ARIZONA COLLEGE

## Elements of Calculus

Course Design

2018-2019

### Course Information

**Division** Mathematics  
**Course Number** MAT 210/SUN# MAT 2212  
**Title** Elements of Calculus  
**Credits** 4  
**Developed by** Ray Orr  
**Lecture/Lab Ratio** 4 Lecture/0 Lab

### Transfer Status

ASU	NAU	UA
MAT 210 (3) & Elective Credit (1), Mathematics (MA)	MAT Departmental Elective --and-- MAT 131; Science & Applied Science [SAS]	MATH 113

**Activity Course** No  
**CIP Code** 27.0101  
**Assessment Mode** Final Exam (15 Questions/75 Points)  
**Semester Taught** Fall  
**GE Category** Mathematics  
**Separate Lab** No  
**Awareness Course** No  
**Intensive Writing Course** No

### Prerequisites

MAT 154 with a grade of "C" or higher or placement test score as established by District policy and ENG 091 with a grade of "C" or higher or reading placement test score as established by District policy

### Educational Value

Students Majoring in Business Administration, Computer Information Systems, Pre-Pharmacy, or an AGEC-B.

### Description

Differential and integral calculus of elementary functions with applications to business, economics, and the social sciences. Not open to students who have received a grade of "C" or higher in MAT 220.

### Supplies

Scientific calculator; TI-83 or TI-84 recommended

## **Competencies and Performance Standards**

### **1. Utilize derivative functions as instantaneous rates of change.**

#### **Learning objectives**

*What you will learn as you master the competency:*

- a. Define the derivative as the instantaneous rate of change at a point.
- b. Visualize the derivative as the slope of the tangent line.
- c. Use the derivative to find where a function is increasing, decreasing or constant.
- d. Interpret the derivative using Leibniz notation.
- e. Use the appropriate units in interpreting derivatives in applications.
- f. Use the second derivative to define concavity of a function.
- g. Perform marginal analysis on economic applications.
- h. Solve equations using logarithms.
- i. Construct and identify polynomial functions.
- j. Model data with various elementary functions.

#### **Performance Standards**

*You will demonstrate your competence:*

- o on assigned activities
- o on written exams
- o on a two hour cumulative final exam

*Your performance will be successful when:*

- o learner demonstrates the ability to visualize derivatives graphically as the slope of the graph
- o learner demonstrates the ability to interpret the meaning of first and second derivatives in various applications
- o learner explains the concept of marginality

### **2. Utilize the definite integral as total change.**

#### **Learning objectives**

*What you will learn as you master the competency:*

- a. Approximate total change from rate of change.
- b. Estimate the definite integral graphically and numerically.
- c. Use the definite integral to define area.
- d. Use the appropriate units in interpreting definite integrals in applications.
- e. Utilize the connection between derivatives and definite integrals with the Fundamental Theorem of Calculus.

#### **Performance Standards**

*You will demonstrate your competence:*

- o on assigned activities
- o on written exams
- o on a two hour cumulative final exam

*Your performance will be successful when:*

- learner explains the definite integral as the limit of Reimann sums
- learner demonstrates the ability to approximate definite integrals graphically and numerically
- learner demonstrates the ability to interpret the definite integral in various contexts
- learner demonstrates the connection between derivatives and the definite integral using the Fundamental Theorem of Calculus

### **3. Apply the short cuts of differentiation to formulas of functions.**

#### ***Learning objectives***

*What you will learn as you master the competency:*

- a. Apply derivative formulas to the elementary functions.
- b. Apply derivative formulas to sums, differences and constant multiples or elementary functions.
- c. Apply the chain rule.
- d. Apply the product and quotient rules.
- e. Find the equations of tangent lines.

#### ***Performance Standards***

*You will demonstrate your competence:*

- on assigned activities
- on written exams
- on a two hour cumulative final exam

*Your performance will be successful when:*

- learner demonstrates the ability to apply the formulas of differentiation to the elementary functions
- learner demonstrates the ability to use the chain, product and quotient rules of differentiation
- learner demonstrates the ability to determine the equations of tangent lines

### **4. Use the derivative to solve application problems involving optimization and graphing.**

#### ***Learning objectives***

*What you will learn as you master the competency:*

- a. Utilize derivatives to find global and local maxima and minima.
- b. Utilize derivatives to find inflection point.
- c. Maximize profit and revenue.
- d. Define and utilize elasticity of demand.
- e. Minimize average cost.
- f. Use the logistic function in application problems.

#### ***Performance Standards***

*You will demonstrate your competence:*

- on assigned activities
- on written exams
- on a two hour cumulative final exam

*Your performance will be successful when:*

- o learner demonstrates the ability to use derivatives in solving application problems involving optimization and graphing
- o learner demonstrates the ability to solve application problems involving the logistic and surge functions

## **5. Use the definite integral to solve application problems.**

### ***Learning objectives***

*What you will learn as you master the competency:*

- a. Define and visualize the average value of a function.
- b. Define consumer and produce surplus using formulas.
- c. Interpret consumer and producer surplus graphically.
- d. Interpret present and future value.
- e. Interpret relative and absolute growth rates of population models.
- f. Use anti-derivatives to determine definite and indefinite integrals.

### ***Performance Standards***

*You will demonstrate your competence:*

- o on assigned activities
- o on written exams
- o on a two hour cumulative final exam

*Your performance will be successful when:*

- o learner demonstrates the ability to solve application problems including average value, consumer and produce surplus, present and future value and population growth
- o learner demonstrates the ability to use anti-derivatives in finding definite and indefinite integrals through the Fundamental Theorem of Calculus

### ***Types of Instruction***

Classroom presentation

### ***Grading Information***

#### ***Grading Rationale***

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. Written exams must represent at least 60% of the final course grade.
2. Final exam must represent at least 20% of the final course grade.
3. Other activities may represent at most 20% of the final course grade.

#### ***Grading Scale***

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	Below 60 %