

Single Variable Calculus – 1st Semester TCSU MATH 210

A. Description

Differential and integral calculus of a single variable. Functions; limits and continuity; differentiation, integration

B. Recommended Preparation

Three years of high school mathematics (or equivalent); college level courses in the study of functions to include polynomial, rational, algebraic, trigonometric, exponential, logarithmic, and other transcendental functions.

C. Prerequisites

Precalculus, or college algebra and trigonometry

D. Minimum Unit Requirement

4 semester units

E. Course Topics

All the topics from the single variable calculus descriptor relating to differentiation (e.g. 4 through 18) and some topics from integration (e.g. 22 through 30). A suggested list of topics could include:

1. Limits, left-hand and right-hand limits
2. Computing limits using numerical, graphical, and algebraic approaches
3. Continuity; continuity at a real number, discontinuity at a real number, removable discontinuity
4. Tangent lines
5. Derivative as a limit
6. Interpretation of the derivative as: slope of tangent line, a rate of change
7. Derivative as a function
8. Differentiation formulas; constants, power rule, product rule, quotient rule
9. Rates of change
10. Derivatives of trigonometric functions
11. Chain rule
12. Implicit differentiation
13. Higher-order derivatives
14. Related rates
15. Maximum and minimum values (absolute and local)
16. Critical numbers
17. Mean Value Theorem
18. Graphing functions using first and second derivatives
19. Limits at infinity, horizontal asymptotes
20. Infinite limits

21. Optimization
22. Antiderivatives
23. Area under a curve
24. Definite integral; Riemann sum
25. Properties of the integral
26. Fundamental Theorem of Calculus
27. Indefinite integrals
28. Integration by substitution
29. Areas between curves
30. Volume, volume of a solid of revolution

F. Student Learning Outcomes

Upon successful completion of the course, students will be able to:

1. Compute the limit of a function at a real number;
2. Determine if a function is continuous at a real number;
3. Find the derivative of a function as a limit;
4. Find the equation of a tangent line to a function;
5. Compute derivatives using differentiation formulas;
6. Apply differentiation to solve related rate problems, optimization problems;
7. Use implicit differentiation;
8. Graph functions using methods of calculus; and
9. Evaluate a definite integral as a limit