

Calculus

Functions C.F

F-LC. Limits and Continuity C.F-LC

- 1 Compute limits of functions. C.F-LC.A
 - 1 Define limits and explain their significance in calculus. C.F-LC.A.1
 - 2 Evaluate limits algebraically, graphically, and numerically. C.F-LC.A.2
 - 2 Solve problems involving continuity and determine the continuity of functions. C.F-LC.B
 - 1 Use limits to define continuity at a point. C.F-LC.B.1
 - 2 Apply the concepts of continuity and the Intermediate Value Theorem. C.F-LC.B.2
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F-D. Derivatives C.F-D

- 1 Use limits to compute derivatives. C.F-D.A
 - 1 Estimate derivatives using difference quotients. C.F-D.A.1
 - 2 Define the instantaneous rate of change at a point as the limit of average rates of change. C.F-D.A.2
 - 3 Identify the derivative of a function using appropriate strategies. For example, rules for sums, differences, products, quotients, and limits of functions. C.F-D.A.3
 - 4 Interpret derivatives as instantaneous rates of change. C.F-D.A.4
 - 5 Explain the relationship between continuity and differentiability at a point. C.F-D.A.5
 - 6 Use limits to define the derivative function. C.F-D.A.6
 - 7 Use limits to find derivatives of simple algebraic functions. C.F-D.A.7
- 2 Compute derivatives. C.F-D.B
 - 1 Compute derivatives of algebraic, trigonometric, inverse, exponential, and logarithmic functions. C.F-D.B.1
 - 2 Apply the rules of differentiation, including the product rule, quotient rule, and chain rule. C.F-D.B.2
 - 3 Compute derivatives of general inverse and implicitly defined functions. C.F-D.B.3
 - 4 Compute higher-order derivatives. C.F-D.B.4

C. Apply the concept of the derivative. C.F-DF.C

- 1 Find the slope of a tangent line at a point. C.F-DF.C.1
- 2 Determine analytically and graphically where a function, or derivative function, is positive or negative, increasing or decreasing, and/or concave up or concave down. C.F-DF.C.2
- 3 Explain the relationships among the behaviors of f , f' , f'' ; for example, if f'' is positive, then f' is increasing and f is concave up. C.F-DF.C.3
- 4 Analyze and sketch graphs of f , f' , f'' . C.F-DF.C.4
- 5 Use the first and second derivative tests to find and classify critical points. C.F-DF.C.5
- 6 Apply the Mean Value Theorem and Extreme Value Theorem. C.F-DF.C.6
- 7 Solve optimization problems involving maxima and minima. C.F-DF.C.7
- 8 Solve related rate problems. C.F-DF.C.8
- 9 Use L'Hospital's rule to compute limits. C.F-DF.C.9
- 10 Interpret derivatives in real-world contexts, such as motion and growth problems. C.F-DF.C.10

F-I. Integrals C.F-I

- 1 Define and interpret integrals. C.F-I.A
 - 1 Use definite integrals to determine net change over an interval. C.F-I.A.1
 - 2 Approximate definite integrals using finite Riemann Sums. C.F-I.A.2
 - 3 Define the definite integral as a limit of a finite Riemann Sum. C.F-I.A.3
 - 4 Interpret definite integrals as net change. C.F-I.A.4
 - 5 State the Fundamental Theorem of Calculus and use it to evaluate definite integrals and construct antiderivatives. C.F-I.A.5
- 2 Compute integrals. C.F-I.B
 - 1 Compute indefinite and definite integrals of algebraic, trigonometric, exponential, inverse, and logarithmic functions. C.F-I.B.1
 - 2 Apply integration techniques, including substitution and integration by parts. C.F-I.B.2
 - 3 Determine if an improper integral converges or diverges using limits of definite integrals. C.F-I.B.3
 - 4 Transform integrands (using substitution and other techniques) to find antiderivatives using a table of integrals. C.F-I.B.4
- 3 Use integrals to solve problems. C.F-I.C
 - 1 Solve problems involving area, volume, and average value of functions. C.F-I.C.1
 - 2 Use integrals to find the area between curves and volume of solids of revolution. C.F-I.C.2
 - 3 Use integrals to solve problems in physics, economics, and other fields. C.F-I.C.3

F-DE. Differential Equations C.F-DE

- 1 Solve and interpret solutions of differential equations. C.F-DE.A
 - 1 Explain the concept of a differential equation. C.F-DE.A.1
 - 2 Solve first-order differential equations, including linear and exponential growth and decay models. C.F-DE.A.2
 - 3 Interpret solutions of differential equations in real-world contexts. C.F-DE.A.3

AT. Advanced Topics C.A.T

- 1 Apply calculus and related skills to advanced topics. C.F-AT.A
 - 1 Explore additional topics such as sequences and series, Taylor polynomials, and polar coordinates (optional depending on course length and student readiness). C.F-AT.A.1
 - 2 Apply calculus concepts to interdisciplinary problems and projects. C.F-AT.A.2
 - 3 Prepare for further study in mathematics, science, engineering, and related fields. C.F-AT.A.3