Practices

MP4: Connecting multiple representations

- associate tables, graphs, and symbolic representations of functions;
- develop concepts using graphical, symbolical, or numerical representations with and without technology;
- identify how mathematical characteristics of functions are related in different representations;
- extract and interpret mathematical content from any presentation of a function (e.g., utilize information from a table of values);
- construct one representational form from another (e.g., a table from a graph or a graph from given information); and
- consider multiple representations of a function to select or construct a useful representation for solving a problem.

MP5: Building notational fluency

- know and use a variety of notations;
- connect notation to definitions (e.g., relating the notation for the definite integral to that of the limit of a Riemann sum);
- connect notation to different representations (graphical, numerical, analytical, and verbal); and
- assign meaning to notation, accurately interpreting the notation in a given problem and across different contexts.

MP6: Communicating

- clearly present methods, reasoning, justifications, and conclusions;
- use accurate and precise language and notation;
- explain the meaning of expressions, notation, and results in terms of a context (including units);
- explain the connections among concepts;
- critically interpret and accurately report information provided by technology; and
- analyze, evaluate, and compare the reasoning of others.

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March 2016

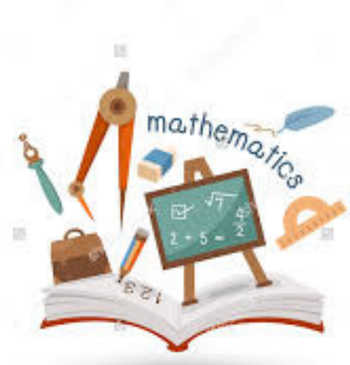
Source Documents:

Based on Common Core Standards for Calculus

Common Core Calculus

Grade 12

Expectations Checklist



COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

Mathematical

MP1: Reasoning with definitions and theorems

- use definitions and theorems to build arguments, to justify conclusions or answers, and to prove results;
- confirm that hypotheses have been satisfied in order to apply the conclusion of a theorem;
- apply definitions and theorems in the process of solving a problem;
- interpret quantifiers in definitions and theorems (e.g., "for all," "there exists");
- develop conjectures based on exploration with technology; and
- produce examples and counterexamples to clarify understanding of definitions, to investigate whether converses of theorems are true or false, or to test conjectures.

MP2: Connecting concepts

- relate the concept of a limit to all aspects of calculus;
- use the connection between concepts (e.g., rate of change and accumulation) or processes (e.g., differentiation and its inverse process, antidifferentiation) to solve problems;
- connect concepts to their visual representations with and without technology; and
- identify a common underlying structure in problems involving different contextual situations.

MP3: Implementing algebraic/computational processes

- select appropriate mathematical strategies;
- sequence algebraic/computational procedures logically;
- complete algebraic/computational processes correctly;
- apply technology strategically to solve problems;
- attend to precision graphically, numerically, analytically, and verbally and specify units of measure; and
- connect the results of algebraic/computational processes to the question asked.

My checklist of what I can do in Calculus – Grade 12 . . . . . .

☐ I understand that it is important to apply the mathematical practices (listed on fold-out section) on a regular basis.

Calculus Standards . . . . . .

C1.0 ☐ **demonstrate knowledge of both the formal definition and the graphical interpretation of limit of values of functions.** This knowledge includes one-sided limits, infinite limits, and limits at infinity. Students know the definition of convergence and divergence of a function as the domain variable approaches either a number or infinity:

- ☐ C1.1 prove and use theorems evaluating the limits of sums, products, quotients, and composition of functions.
- ☐ C1.2 use graphical calculators to verify and estimate limits.
- ☐ C1.3 prove and use special limits, such as the limits of (sin(x))/x and (1-cos(x))/x as x tends to 0.

C2.0 ☐ **demonstrate knowledge of both the formal definition and the graphical interpretation of continuity of a function.**

C3.0 ☐ **demonstrate an understanding and the application of the intermediate value theorem and the extreme value theorem.**

C4.0 ☐ **demonstrate an understanding of the formal definition of the derivative of a function at a point and the notion of differentiability:**

- ☐ C4.1 demonstrate an understanding of the derivative of a function as the slope of the tangent line to the graph of the function.
- ☐ C4.2 demonstrate an understanding of the interpretation of the derivative as an instantaneous rate of change. Students can use derivatives to solve a variety of problems from physics, chemistry, economics, and so forth that involve the rate of change of a function.
- ☐ C4.3 understand the relation between differentiability and continuity.
- ☐ C4.4 derive derivative formulas and use them to find the derivatives of algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions.

Calculus Standards (continued) . . . . . .

C5.0 ☐ **know the chain rule and its proof and applications to the calculation of the derivative of a variety of composite functions.**

C6.0 ☐ **find the derivatives of parametrically defined functions and use implicit differentiation in a wide variety of problems in physics, chemistry, economics, and so forth.**

C7.0 ☐ **compute derivatives of higher orders.**

C8.0 ☐ **know and can apply Rolle's theorem, the mean value theorem, and L'Hôpital's rule.**

C9.0 ☐ **use differentiation to sketch, by hand, graphs of functions. They can identify maxima, minima, inflection points, and intervals in which the function is increasing and decreasing.**

C10.0 ☐ **know Newton's method for approximating the zeros of a function.**

C11.0 ☐ **use differentiation to solve optimization (maximum-minimum problems) in a variety of pure and applied contexts.**

C12.0 ☐ **use differentiation to solve related rate problems in a variety of pure and applied contexts.**

C13.0 ☐ **know the definition of the definite integral by using Riemann sums. They use this definition to approximate integrals.**

C14.0 ☐ **apply the definition of the integral to model problems in physics, economics, and so forth, obtaining results in terms of integrals.**

Calculus Standards (continued) . . . . . .

C15.0 ☐ **demonstrate knowledge and proof of the fundamental theorem of calculus and use it to interpret integrals as antiderivatives.**

C16.0 ☐ **use definite integrals in problems involving area, velocity, acceleration, volume of a solid, area of a surface of revolution, length of a curve, and work.**

C17.0 ☐ **compute, by hand, the integrals of a wide variety of functions by using techniques of integration, such as substitution, integration by parts, and trigonometric substitution. They can also combine these techniques when appropriate.**

C18.0 ☐ **know the definitions and properties of inverse trigonometric functions and the expression of these functions as indefinite integrals.**

C19.0 ☐ **compute, by hand, the integrals of rational functions by combining the techniques in standard 17.0 with the algebraic techniques of partial fractions and completing the square.**

C20.0 ☐ **compute the integrals of trigonometric functions by using the techniques noted above.**

C21.0 ☐ **understand the algorithms involved in Simpson's rule and Newton's method. They use calculators or computers or both to approximate integrals numerically.**

C22.0 ☐ **understand improper integrals as limits of definite integrals.**

Calculus Standards (continued) . . . . . .

C23.0 ☐ **demonstrate an understanding of the definitions of convergence and divergence of sequences and series of real numbers. By using such tests as the comparison test, ratio test, and alternate series test, they can determine whether a series converges.**

C24.0 ☐ **understand and can compute the radius (interval) of the convergence of power series.**

C25.0 ☐ **differentiate and integrate the terms of a power series in order to form new series from known ones.**

C26.0 ☐ **calculate Taylor polynomials and Taylor series of basic functions, including the remainder term.**

C27.0 ☐ **know the techniques of solution of selected elementary differential equations and their applications to a wide variety of situations, including growth-and-decay problems.**

How to use checklist:

- Show the date of when you were able to do the math expectation.
- Show an example of what you did in a journal.