

Changes to Northwestern SPS Calculus Curriculum effective Fall 2019:

- Three new courses, MATH 220-A, MATH 220-B, and MATH 226-0, are replacing MATH 220-CN and MATH 224-CN as the standard single-variable calculus sequence. Most students who would have taken MATH 220-CN or MATH 224-CN should now take MATH 220-A or MATH 220-B, respectively.
- MATH 226-CN is a new course; it will not be a prerequisite for the multivariable calculus courses, but will be a prerequisite for many upper-level mathematics courses, and will be a required course for the mathematics major starting Fall 2019.
- A multivariable calculus sequence of two courses, MATH 230-A and 230-B, is replacing MATH 230-CN and MATH 234-CN. MATH 230-A is largely equivalent to MATH 230-CN, and MATH 230-B is largely equivalent to MATH 234-CN.

Changes to the Mathematics major effective Fall 2019:

The new calculus curriculum will affect the requirements for the mathematics major in SPS, including an additional course (MATH 226). These changes will go into effect in the Fall 2019 quarter.

Current Major Requirements	New Major Requirements starting Fall 2019
MATH 220	MATH 220-A Single-Variable Differential Calculus
MATH 224	MATH 220-B Single-Variable Integral Calculus
MATH 230	MATH 226 Sequences and Series
MATH 234	MATH 230-A Multivariable Differential Calculus
MATH 240	MATH 230-B Multivariable Integral Calculus
7 300-level mathematics courses	MATH 240 Linear Algebra
Total: 12	7 300-level mathematics courses
	Total: 13

Students who started the mathematics major in SPS prior to Fall 2019 will need to complete only the calculus courses—in the new numbering format—that are required for the pre-Fall 2019 major. See the Calculus Course Placement and Calculus Course Equivalence tables below. Continuing math majors will not have to complete the new course MATH 226.

The following table shows courses students should take if they have begun, but not completed, the calculus curriculum prior to Fall 2019. Incoming students or students who have not started the calculus courses as of Fall 2019 will begin with MATH 220-A.

Calculus course placement for continuing students	
Students who most recently completed . . .	should continue in . . .
MATH 220 MATH 224 MATH 230	MATH 220-B MATH 226 or MATH 230-A MATH 230-B

The table below details the credit equivalence between the old and new courses:

Credit Equivalence between old and new courses	
Students cannot earn credit for both . . .	and . . .
MATH 220 MATH 224 MATH 230 MATH 234	MATH 220-A MATH 220-B or MATH 226-CN MATH 230-A MATH 230-B

Descriptions for the new calculus courses are listed below.

MATH 220-A Single-Variable Differential Calculus

Limits. Differentiation. Linear approximation and related rates. Extreme value theorem, mean value theorem, and curve-sketching. Optimization.

MATH 220-B Single-Variable Integral Calculus

Definite integrals, antiderivatives, and the fundamental theorem of calculus. Transcendental and inverse functions. Areas and volumes. Techniques of integration, numerical integration, and improper integrals. First-order linear and separable ordinary differential equations. Prerequisite: MATH 220-A.

MATH 226 Sequences and Series

Sequences, series, and convergence tests. Power series, Taylor Polynomials and error. Complex numbers. Second-order linear ordinary differential equations and power series solutions. Prerequisite: MATH 220-B.

MATH 230-A Multivariable Differential Calculus

Vectors, vector functions, partial derivatives, and optimization. Prerequisite: MATH 220-B

MATH 230-B Multivariable Integral Calculus

Multiple integration: double integrals, triple integrals, and the change of variables theorem. Vector calculus: vector fields, line integrals, surface integrals, curl and divergence, Green's theorem, Stokes' theorem, and the divergence theorem. Prerequisite: MATH 230-A