

New Math Courses

April 18, 2016

What's New in 2016: Updates are all in Section II. The old "engineering calculus" sequence will no longer be offered. There is a new two-credit Math 2984: Series and Polar Coordinates that can be added to Math 1205-1206 to give credit equivalent to Math 1225-1226. See New in 2016 labels for details.

Math 1014 – Precalculus with transcendental functions (3 credits.)

Math 1025-1026 – Elementary calculus (1025: 3 cr.; 1026: 3 cr.)

Math 2024 – Intermediate calculus (3 cr.)

Math 1225-1226 – Calculus of a single variable (1225: 4 cr.; 1226: 4 cr.)

Math 2114 – Introduction to linear algebra (3 cr.)

Math 2204 – Introduction to multivariable calculus (3 cr.)

I. Sequence for life sciences, etc.

Old sequence	New sequence
1015	1014
1016	1025
2015	1026
2016	2024

Each course in the new sequence is mathematically essentially equivalent to the course on the same row in the old sequence. We recommend that, for all purposes, an old and a new course on the same row play exactly the same role. These purposes include degree requirements, prerequisites, Math 1225 Readiness (was Math 1205 Readiness), and substitutions. A student who passes either course in one row can progress to either course in the next row. For that reason the new courses will replace the old courses quickly. Math 1026 will replace Math 2015 in spring 2015. The other three replacements will occur in fall 2014.

Advice for students. If you have credit for a course in either column of a row in the above table, you may proceed to a course in either column of the next row.

Advice for advisors and curriculum committees. We recommend that wherever a course in the old sequence was a prerequisite or degree requirement, the course on the same row in the new sequence should play the same role. It may be a good idea to use (old number OR new number) statements until all the students who earned credits in the old sequence have left the university. The university may be able to automate changes in prerequisites and degree requirements.

For students entering in summer 2014 or after, we will evaluate AP, IB, etc. credit in the new sequence, and we will evaluate transfer credit in the new sequence where possible. The essential equivalence between the old and new sequences will govern what credit is awarded. For information about credit to be awarded for other new courses, see the discussion of the engineering, etc. sequence below.

Warning. A student who needs a **year of calculus** on a transcript must take Math 1025-1026. In the past the sequence Math 1015-1016 was called calculus, but 1015 covered precalculus only, so the sequence included only one semester of calculus. The names in the new sequence align correctly with the content.

Math 1014, 1025, and 1026 have **CLE Area 5** status. Math 2016 had CLE Area 5 status solely because it was in a sequence with Math 2015, for which CLE Area 5 status was appropriate. Math 2024 does not have CLE Area 5 status, but the path that brings a student to Math 2024 will meet CLE Area 5 requirements.

The new courses will include more life sciences applications than the old courses.

II. Sequence for engineering, etc.

Math 1225 (4 credits), 1226 (4 credits), and 2204 (3 credits) will cover the calculus material covered in the 11 credits of Math 1205, 1206, 1224, and 2224.

Prerequisite dependence in lower division classes for engineers, etc.

Math 1225. A student must be Math 1225 Ready. The criterion is the same as the old Math 1205 Ready.

Math 1226. The prerequisite is Math 1225 with a grade of at least C-.

Math 2114. The prerequisite is Math 1226 or a B or higher in VT Math 1225.

Math 2204. The prerequisite is Math 1226.

Math 2214. The prerequisite is Math 1226 and (Math 1114 or Math 2114).

Advice for students

If you enter VT with math credit (transfer, AP, IB, etc.), your choice of math class is often determined by your in-major requirements and by the prerequisite relationships among math courses. There is one situation where the prerequisites leave choices. **If you enter VT with Math 1225-1226 credit** and you want to continue in the sequence for engineers, etc., your first-semester choices are the following. (a) Take Math 1114 or 2114 (depending on your in-major requirements and your interest in taking the more challenging 2114). You will be able to take Math 2204 and/or Math 2214 in any subsequent semester. (b) Take Math 2204. You will be able to take Math 1114 or 2114 next and to take Math 2214 after that. (c) Take Math 1114 and 2204 (if your major accepts Math 1114 as meeting its lower division linear algebra requirement). You will be able to take Math 2214 in any subsequent semester. The combination of Math 2114 and Math 2204 is also possible, but in order to balance our enrollments across semesters, we ask students not to take Math 2114 and Math 2204 simultaneously in their first semester if that first semester is a fall semester. Regarding the choice between starting in 2204 and starting in 2114: the advantage of starting in 2204 is that 2204 is likely to feel like a gentler introduction to university math; while the advantage of starting in 2114 is that doing so creates the possibility of finishing the 2000-level courses more quickly by taking both 2204 and 2214 in the following semester.

Try to avoid switching from the old calculus (1205, 1206, 1224, 2224) to the new calculus (1225, 1226, 2204). However, if you have credit for Math 1205 and do not have credit for Math 1206, you will have to switch from the old sequence to the new sequence in order to complete the curriculum. Switch from old to new by passing the following courses in the order listed.

1. Pass Math 2984: The Integral.
2. Pass Math 1226.
3. Pass Math 2204.

Math 2984: The Integral is a one-credit class offered in a distance-learning format (available to students on and off the Blacksburg campus). The combination (Math 1205 and Math 2984: The Integral) is equivalent to Math 1225. Math 2984: The Integral will be offered for the first time during Summer I, 2015. It can be offered as needed thereafter.

Warning: the course number 2984 must be used for many purposes. The only Math 2984 that plays the calculus transition role described above is the Math 2984 titled **The Integral**.

New in 2016

If you have credit for Math 1205 and Math 1206 and do not now have credit for Math 1224, you will have to switch from the old sequence to the new sequence in order to complete the curriculum. Switch from old to new by passing the following courses in the order listed.

1. Pass Math 2984: Series and Polar Coordinates.
2. Pass Math 2204.

Math 2984: Series and Polar Coordinates is a two-credit class offered in a distance-learning format (available to students on and off the Blacksburg campus). The combination (Math 1205-1206 and Math 2984: Series and Polar Coordinates) is equivalent to Math 1225-1226. Math 2984: Series and Polar Coordinates will be offered for the first time during Summer I, 2016. It can be offered as needed thereafter.

Warning: the course number 2984 must be used for many purposes. The only Math 2984 that plays the calculus transition role described immediately above is the Math 2984 titled **Series and Polar Coordinates**.

New in 2016

If you have credit for Math 1205, Math 1206, and Math 1224 and do not have credit for Math 2224, you will have to switch from the old sequence to the new sequence in order to complete the curriculum. Switch from old to new in one of two ways.

First way to switch: Pass Math 2984: Series and Polar Coordinates and then pass Math 2204.

Second way to switch: Enroll in Math 2204 via the Math Department's force-add process, where you will have to sign a form indicating that you assume the risk of taking Math 2204 without completing all the prerequisites. You will be allowed to assume this risk only if you have credit for Math 1206 and Math 1224. To earn a Math degree, you will also have to pass Math 2984: Series and Polar Coordinates. Some departments may allow their majors who have credit for Math 1205-1206 and Math 1224 to skip Math 2984: Series and Polar Coordinates. Ask your advisor about your department's policy.

Warning: the course number 2984 must be used for many purposes. The only Math 2984 that plays the calculus transition role described immediately above is the Math 2984 titled **Series and Polar Coordinates**.

Further advice for students switching from the old sequence to the new sequence.

If you have credit for Math 1206, you may enroll in Math 2114 by participating in the Math Department's force-add process.

If you have credit for Math 1206 and either of Math 1114 or Math 2114, you may enroll in Math 2214 by participating in the Math Department's force-add process.

Advice for advisors

For students entering in summer 2014 or after, we will evaluate AP, IB, etc. credit in the new sequence, and we will evaluate transfer credit in the new sequence where possible.

Where we used to award AP, IB, etc. credit for Math 1205, we will award AP, IB, etc. credit for Math 1225. Where we used to award AP, IB, etc. credit for Math 1205-1206, we will award AP, IB, etc. credit for Math 1225-1226.

If you have a degree requirement for which you accept Math 1205 as a substitution, you should accept Math 1225 as a substitution.

If you have a degree requirement for which you accept Math 1206 as a substitution, you should accept Math 1226 as a substitution.

If you have a degree requirement for which you accept Math 1224 as a substitution, you should accept Math 2204 as a substitution.

If you have a degree requirement for which you accept Math 2224 as a substitution, you should accept Math 2204 as a substitution.

If a student has credit for Math 1206, the student may enroll in Math 2114 by participating in the Math Department's force-add process.

If a student has credit for Math 1206 and either of Math 1114 or Math 2214, the student may enroll in Math 2214 by participating in the Math Department's force-add process.

New in 2016: Your department's curriculum committee should tell you whether your majors who have credit for Math 1205-1206 and 1224 need Math 2984: Series and Polar Coordinates credit in addition to Math 2204 credit.

Math 1225-1226 will satisfy **CLE Area 5** requirements.

Advice for curriculum committees

Until students from the old sequence have graduated, you may wish to include OR statements in prerequisites and degree requirements. For example, if Math 1205 is a prerequisite now, that prerequisite should change to (Math 1205 or Math 1225), and years from now it should become Math 1225. The university may be able to automate changes in prerequisites and degree requirements.

If Math 1205 is currently a prerequisite or degree requirement, in the new sequence that prerequisite or degree requirement should be Math 1225.

If Math 1206 is currently a prerequisite or degree requirement, in the new sequence that prerequisite or degree requirement should be Math 1226.

In most cases where Math 1224 is currently a prerequisite or degree requirement, in the new sequence that prerequisite or degree requirement should be Math 2204. In a few cases, the topics required may all be in Math 1226.

If Math 2224 is currently a prerequisite or degree requirement, in the new sequence that prerequisite or degree requirement should be Math 2204.

The combination (Math 1205 and Math 2984: The Integral) is equivalent to Math 1225. DARS will require a by-hand substitution to recognize this equivalence.

New in 2016: The combination (Math 1205-1206 and Math 2984: Series and Polar Coordinates) is equivalent to Math 1225-1226. DARS will require a by-hand substitution to recognize this equivalence.

New in 2016: A student who has credit for Math 1205-1206, 1224, and 2204 and who does not have credit for Math 2984: Series and Polar Coordinates will have seen every topic in our calculus curriculum except sequences and series.

Math 1114 will continue to be offered as long as there is demand. If Math 1114 is sufficient for your purposes, there is no compelling reason to replace Math 1114 by Math 2114 in your prerequisites or degree requirements.

Explanation

Math 1225 includes all of Math 1205 plus some material from Math 1206.

The sequence Math 1225-1226 covers all the material from the old sequence Math 1205-1206 plus some material from the old Math 1224 and Math 2224.

Math 2984: The Integral covers exactly the Math 1225 topics not included in Math 1205.

New in 2016: Math 2984: Series and Polar Coordinates covers exactly the Math 1225-1226 topics not included in Math 1205-1206.

Topics from the old Math 1224 and 2224 are distributed into Math 1226 and Math 2204. A student will not have seen all of Math 1224 or Math 2224 until that student has taken both Math 1226 and Math 2204.

Math 2114 will include all the topics covered by Math 1114 but will do so in a more conceptually sophisticated context. Math 2114 will also include some topics not covered in Math 1114. Mathematics B.S. requirements will change from Math 1114 to Math 2114 for students entering in or after fall 2014. **New in 2016:** Starting in Fall 2016, many upper division math classes taught primarily for math majors will have Math 2114 as an explicit or implicit prerequisite. Math 2214, Math 4564, and Math 4574 will not require Math 2114; either Math 1114 or Math 2114 will suffice for those courses.

Math 1225 and Math 1226 mesh well with the AP distinction between the AB and BC curricula.

In many cases the new courses will match up better with the courses students transfer from other post-secondary institutions. Transfer credits require a course-by-course analysis, which has already begun.

III. Switching from the life sciences, etc. sequence to the engineering, etc. sequence

Advice for students. Regardless of the credits you have in the life sciences, etc. sequence, if you wish to switch to the engineering, etc. sequence, you must start the engineering sequence in Math 1225.

Advice for advisors and curriculum committees. None of Math 1014, 1025, 1026, and 2024 should substitute for any course in the engineering calculus sequence, just as was the case for Math 1015, 1016, 2015, and 2016.

IV. Switching from the engineering, etc. sequence to the life sciences, etc. sequence

Advice for students

If you have credit for Math 1225 or 1205 (but not 1206 or 1226) and you wish to switch to the life sciences, etc. sequence, you may take Math 1026.

If you have credit for Math 1225-1226 or Math 1205-1206 (but not 2204 or 2224) and you wish to switch to the life sciences, etc. sequence, you may take Math 2024.

Substitution for Math 2024 is at the discretion of the department requiring Math 2024.

Advice for advisors and curriculum committees

Math 1225 may substitute for Math 1025, just as Math 1205 substituted for Math 1016.

Math 1226 may substitute for Math 1026, just as Math 1206 substituted for Math 2015.

Substitution for Math 2024 is at the discretion of the department requiring Math 2024.

Explanation

Math 1025 and Math 1225 are mostly differential calculus. Math 1225 is more conceptually and technically sophisticated.

Math 1026 and Math 1226 are mostly integral calculus. Math 1226 is more conceptually and technically sophisticated.

Math 2024 combines multivariable calculus, sequences and series, and differential equations, all treated in less depth than in Math 2204, 1226, and 2214, respectively.