

A Perspective on Grades and Grading

MATH 104/184

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Students in MATH 104 and MATH 184, like most first-year students at UBC, are concerned with their grades. Very few other things cause as much stress for you in your first year. This is entirely understandable on two fronts: (1) for many of you, how well you do in these courses will determine whether or not you remain in, or are admitted to, a number of competitive entry programs; and (2) you have no prior experience with marks at UBC.

I'd like to share with you a professor's perspective on grades and on grading.

I will begin at the end: what do the final grades in these courses mean? After this, I will discuss how I view midterm grades (which are NOT final grades). Finally, I will tell you how your final grade is computed.

1 Interpreting the grade that appears on your transcript.

Like most courses in the Faculties of Arts and Science at UBC, the average grade in MATH 104 and MATH 184 over all sections of these courses typically ends up being in the high 60s. (This is quite a contrast to the average MATH 12 grade of students in these courses, which tends to be around 90%, with a standard deviation of less than 10 percentage points.) What do these final grades *mean*?

1.1 What does an A mean?

At UBC, any grade of 80% or higher is an A (one of A-, A, or A+). If you earn an A in MATH 104/184, it means that you have *mastered* the material in these courses. By master, I mean you have demonstrated that you have met almost ALL of the stated learning goals for the courses by solving most of the problems presented to you that require these skills. It also means that you have integrated the ideas represented by the individual technical learning goals into a comprehensive understanding of differential calculus, and you have demonstrated your comprehensive understanding by solving

the most difficult problems on the exam, problems which may include new situations in which you have been asked to apply the principles you studied in MATH 104/184. 'A' students confidently tackle new problems presented to them and can do so under the constraint of a timed exam. 'A' students have strong technical skills, including algebra skills, and do not make many computational errors. They also correctly use notation and have learned how to present their solutions in precise, concise, and logical ways.

1.2 What does a B mean?

At UBC, a grade of B (one of B-, B, or B+) means that you have received a grade from 68% to 79%. (Note that 79% is almost never given as a final grade in a course; a professor can be asked to justify a 79%, which can be hard to do.) If you earn a B in MATH 104/184, it means that you have a solid command of many of the stated learning goals for these courses as demonstrated by your ability to solve most of the basic problems presented to you, and many of the more challenging problems you encountered in the course. It also means that you have started to build a comprehensive understanding of calculus, but that you probably need to spend more effort in order to build that understanding to the point where you can solve the most difficult problems on an exam, or where you can comfortably apply your skills to new situations without some effort. 'B' students have some difficulty tackling new problems, but can generally work to a solution as long as they are given enough time. 'B' students still need to work on their basic technical skills, and they may make more computational errors, including basic algebra errors, than they would with more practice. 'B' students sometimes misuse notation, and the work they present on exams tends to be somewhat disorganized.

1.3 What does a C mean?

At UBC, a grade of C (one of C-, C, or C+) means that you have received a grade from 55% to 67%. If you earn a C in MATH 104/184, it means that you have a basic understanding of some of the learning goals in the course as demonstrated by your ability to solve the basic problems presented to you, but there are many learning goals you have not mastered. You likely have difficulty with learning goals that require you to have mastered prior technical skills, or that require you to use several technical skills at once. You find the

most difficult problems in the course challenging, and you rarely get very far in solving them on your own. You have a difficult time seeing how everything you are learning fits together into the 'big picture.' 'C' students still need more practice with basic computational skills, and they need more experience to build the skills necessary to solve complex problems. 'C' students make many computational errors, including basic algebra errors, and their work is often very disorganized and demonstrates a lack of basic logical thinking. 'C' students likely will struggle in courses that have MATH 104/184 as a pre-requisite unless they make some effort on their own to continue to develop their skills.

1.4 What does a D mean?

A D is given if your grade is from 50% to 54%. If you earn a D in MATH 104/184, it means that you have demonstrated a bare minimum understanding of some basic learning goals in these courses. It is likely that you can correctly take derivatives of simple functions, for example, and that you can successfully solve a selection of base-level calculus problems that require only one or two technical skills to solve. You likely are working at a high school level and cannot solve any problems of even a moderate difficulty. You may have serious deficiencies in algebra. You have passed, but you have a high likelihood of failing any course having MATH 104/184 as a pre-requisite.

1.5 What does an F mean?

You earn an F if your grade is less than 50%. This means that you have failed to master enough basic learning goals to successfully solve most of the problems presented to you. You are not prepared to use the material in these courses and would need to re-take MATH 104 or 184 in order to continue in any degree program requiring one of these courses.

2 How should I interpret my midterm grades?

My role as an instructor is to provide you with clear learning goals. This is why I publish detailed weekly learning goals for this course. These include suggested problems from the text to help guide you in what you might do to master these learning goals.

Your role as a student is to figure out how you will master these learning goals. (Part of the answer: DO PROBLEMS!)

As part of the course, we give you midterm exams. These exams serve the purpose of giving you an indication of how well you are mastering the learning goals. Each instructor chooses a marking scheme to communicate to you feedback she or he feels is important for you to have to be sure you know what it takes to master these learning goals.

I choose my marking scheme to focus on particular technical details to push students to be precise and logical in their work so they will have the skills necessary to tackle successfully the hardest problems on the final exam. As a result, I am a bit of a hard marker. I do this because it has been my experience that this helps students master the learning goals. (And, historically, their final grades support my belief.)

Because you all have 80s or better in your MATH 12 courses, the marks on your first MATH 104/184 midterm may shock you. Remember, the midterm grade isn't your final grade, BUT, it will give you a good indication of what you need to do in order to achieve the level of mastery you need to get the grade you want (read carefully what it means to earn an A). *Deal with your emotional response, but don't let that be where you stop: set yourself goals and work out a strategy to achieve them.*

We will communicate how you should look at the grades on your midterms. This will help you assess what further work you need to do to improve your understanding of this material so you can demonstrate your mastery of it on the final exam.

My main message on your midterm grades is to use them to guide your studying. Remember, if your goal is to get an A, you have to *master* the learning goals, and this includes demonstrating an ability to tackle difficult (and even new!) problems successfully. You need to demonstrate that you know how to be precise and logical, and that you present your work in a coherent fashion. If you take a cold, hard look at your first midterm, then if you didn't get an A and you think you should have, ask yourself this: was it really an A paper? Be honest with yourself, or you will not do what you need to do in order to get an A in this course.

3 Last Words on Final Grades

I will end by simply saying that there is no magic marks fairy who waves a wand over the grades in this course and turns them into something they are not. It is my experience that students in MATH 104/184 will work hard and their grades will reflect their individual efforts.

For clarity, I present to you now exactly how the final scaling works. First, the exam is board marked, which means that a small group of markers is set to mark each question. That group sets a common marking scheme for their question and rigidly applies it to mark that question on ALL of the MATH 104/184 exams. This ensures that marking is consistent across all sections. The final exam is then *calibrated*, which means that we decide if the raw exam grade distribution is reasonable. If it isn't, we make adjustments to the overall raw exam grade distribution based on the academic judgment of the instructors; we don't look at individual students in this process. (Each exam is different and so raw grades on exams are meaningless without this calibration step.) Because both the exam and its marking are in common, it can be used to normalize grades across all the individual sections. While the midterms are also in common, there is a 10% component of the grade that is at the discretion of the individual instructor. To ensure that this grade component does not skew the grades unfairly, the final exam will be used to normalize the term grades.

Each section instructor produces a term grade, which is 50% of the final grade, for each student. These grades will be scaled according to that section's performance on the final exam. I will show you what happens next by example. Suppose that in my section the median term grade is 60% and the median grade on the final exam *for my section* is 70%. I will then scale my section's term grades so that 0% stays fixed at 0%, 100% stays fixed at 100%, and the median of 60% is moved to match the exam median of 70%. This creates the following piecewise-linear function that is used to transform the term grades: Let T be the raw term grade out of 100. Then the new term grade $N(T)$ is given by

$$N(T) = \begin{cases} \frac{70}{60}T & \text{if } T \leq 60, \\ 70 + \frac{100-70}{100-60}(T - 60) & \text{if } 60 < T \leq 100. \end{cases}$$

The final grade is then computed as 50% of this new term grade plus 50% of the final exam grade out of 100.

Note that this scaling preserves order (no one jumps over someone else) and that very low or very high term grades don't move much. A 30% would go to 35%, for example, and an 80% goes to 85%.