MAT 131 Calculus I

Spring 2018

Instructor.	**Zhiqiang Li**
Office	Math Tower 5D-148C
Office Hours	Tue & Thur 3:00 pm - 4:00 pm; MLC: Thur 2:00 - 3:00 pm
E-Mail	lizq at math .stonybrook .edu

Blackboard.

Grades and some course administration will take place on Blackboard. Please login using your NetID at http://blackboard.stonybrook.edu.

Course description

MAT 131 is the first course in the 2-semester single variable calculus sequence. It covers limits, continuous functions, derivatives and their applications, antiderivatives and the fundamental theorem of calculus. The course moves rather quickly. Students who would like to learn the same material at a somewhat slower pace should take MAT 125. The three-semester sequence MAT 125-126-127 covers the same material as the two-semester sequence MAT 131-132.

Syllabus

Please view here.

Written homework

Homework 1 (Due 2nd recitation in the week of 2/12): **2.3**: 7, 32, 46, 49; **2.4**: 27, 36, 41, 53; **2.5**: 26, 27, 35, 40; **3.1**: 16, 71; **3.2**: 52.

Homework 2 (Due 2nd recitation in the week of 2/26): **3.3**: 13, 33; **3.4**: 21, 62, 63; **3.5**: 12, 53; **3.6**: 9, 26; **3.7**: 27, 48.

Homework 3 (Due 2nd recitation in the week of 3/20): **4.1:** 17, 38; **4.5:** 35, 36, 42, 58, 63, 64, 71.

Homework 4 (Due 2nd recitation in the week of 4/9): **4.3**: 37, 69; **4.6**: 31; **5.1**: 22, 28; **5.2**: 54, 56.

Homework 5 (Due 2nd recitation in the week of 5/1): **5.3**: 31, 76; **5.4**: 3, 17, 23, 30; **5.5**: 6, 19, 48, 68, 71, 72.

Tentative schedule

Week of 1/22: 2.2, 2.3 Limits, 2.4 Continuity.

Week of 1/29: 2.4 Continuity, 2.5 Limits, 3.1, 3.2 Derivatives.

Week of 2/5: 2.6, 2.7, 2.8, 3.1, 3.3 Derivatives, 3.4 Chain Rule.

Week of 2/12: 3.5, 3.6, 3.7 More derivatives.

Week of 2/19: Review, Midterm I, 4.5 L?Hospital rule.

Week of 2/26: 4.5 L?Hospital rule.

Week of 3/5: 4.1 Related rates.

Week of 3/12: Spring Break.

Week of 3/19: 2.8, 4.3 Curve sketching.

Week of 3/26: 4.2, 4.6 Optimization, Review, Midterm II.

Week of 4/2: 5.1, 5.2 Riemann sums.

Week of 4/9: 5.1, 5.2 Riemann sums, 4.8, 5.3 Antiderivatives, 5.4 The fundamental theorem.

Week of 4/16: Exercises, 5.5 Substitution rules.

Week of 4/23: 5.5 Substitution rules, Review.

Week of 4/30: Review.

Week of 5/7: **Final exam**.

Exams

Midterm I: 2/21 8:45 pm. Location: Javits 110.

Midterm II: 3/28 8:45 pm. Location: Javits 110. Practice Exam.

Final exam: 5/9 11:15 am - 1:45 pm. Location: Javits 109. Practice Exam.

MAT 131 Calculus I

Spring 2018

Syllabus

Instructor. Zhiqiang Li

Email: lizq@math.stonybrook.edu

Office: Math Tower 5D-148C

Office hours: Tuesday 3 - 4 pm, Thursday 3 - 4 pm, or by appointment

MLC hours: Thursday 2 - 3 pm

Blackboard. Grades and some course administration will take place on Blackboard. Please login using your NetID at `http://blackboard.stonybrook.edu`.

Course description. MAT 131 is the first course in the 2-semester single variable calculus sequence. It covers limits, continuous functions, derivatives and their applications, antiderivatives and the fundamental theorem of calculus. The course moves rather quickly. Students who would like to learn the same material at a somewhat slower pace should take MAT 125. The three-semester sequence MAT 125-126-127 covers the same material as the two-semester sequence MAT 131-132.

Textbook. *Single Variable Calculus: Concepts and Contexts*, 4$^{\text{st}}$ Edition (Stony Brook Edition), by James Stewart.

Tentative schedule.

- Week of 1/22: 2.2, 2.3 Limits, 2.4 Continuity.
- Week of 1/29: 2.4 Continuity, 2.5 Limits, 3.1, 3.2 Derivatives.
- Week of 2/5: 2.6, 2.7, 2.8, 3.1, 3.3 Derivatives, 3.4 Chain Rule.
- Week of 2/12: 3.5, 3.6, 3.7 More derivatives.
- Week of 2/19: Review, **Midterm I**, 4.5 L'Hospital rule.
- Week of 2/26: 4.5 L'Hospital rule.
- Week of 3/5: 4.1 Related rates.
- Week of 3/12: **Spring Break**.
- Week of 3/19: 2.8, 4.3 Curve sketching.
- Week of 3/26: 4.2, 4.6 Optimization, Review, **Midterm II**.
- Week of 4/2: 5.1, 5.2 Riemann sums.
- Week of 4/9: 5.1, 5.2 Riemann sums, 5.3 Antiderivatives, 5.4 The fundamental theorem.
- Week of 4/16: Exercises, 5.5 Substitution rules.
- Week of 4/23: 5.5 Substitution rules, Review.
- Week of 4/30: Review.
- Week of 5/7: **Final exam**.

Exams. There will be two midterms and a final exam. There will be no makeup exams.

- Midterm I: 2/21 8:45 pm. Location: TBA.
- Midterm II: 3/28 8:45 pm. Location: TBA.
- Final exam: 5/9 11:15 am - 1:45 pm. Location: TBA.

Grade Distribution.

- Midterm I: 25%
- Midterm II: 25%
- Final exam: 30%
- Written homework: 10%
- WebAssign: 10%

Students are expected to attend class regularly and to keep up with the material presented in the lecture and the assigned reading. There will be a few written assignments during the whole semester as well as weekly web assignments (WebAssign).

Written assignments. There will be a few written assignments during the whole semester. They will be announced during lecture. The will be collected and returned during recitations. A selected number of questions will be graded in each assignment.

WebAssign. WebAssign will beginning 1/25, students will be assigned web-based exercises using an online system.
Note that Webassign access is **free for the first two weeks and includes an electronic text**. **Please visit** `http://www.math.stonybrook.edu/~scott/mat126.fall16/textbook.html` to see a discussion of purchasing options for the WebAssign. You **should** purchase your WebAssign through links provided on this webpage.
Please refer to `http://www.math.stonybrook.edu/~lombardi/mat131webassign.pdf` for a helpful guide on how to use WebAssign
Information on how to access this system will be brought to you via your Blackboard account by 1/25. Please pay careful attention to due dates as there are no extensions!

Extra help. You are welcome to attend the office hours and ask questions about the lectures and about the homework assignments. In addition, math tutors are available at the MLC: `http://www.math.sunysb.edu/MLC`.

Special needs. If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748, or at the following website
`http://studentaffairs.stonybrook.edu/dss/index.shtml`. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Academic integrity. Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another persons work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at `http://www.stonybrook.edu/uaa/academicjudiciary`.

MAT 131 Spring 2018 Midterm II (Practice)

Name: **ID:** **Recitation Number:**

There are four problems with indicated values.

Show your work. Continue writing on the back of the pages if needed.

Do not tear-off any page(s).

No calculators, no cellphones, etc.

1	24	
2	20	
3	20	
4	36	
Total	100	

Name: _____ Problem 1: _____/24

Problem 1 (24 points) In each of the following statements, circle T if it is true and F if it is false. There is no need to show your work in this problem.

T F (1) The limit $\lim_{x\to 0^+} \tan(x)^x$ is of an indeterminate form for the purpose of applying L'Hospital's Rule.

T F (2) The limit $\lim_{x\to+\infty} \sin(x)^{\frac{1}{\sin(x)}}$ is of an indeterminate form for the purpose of applying L'Hospital's Rule.

T F (3) The limit $\lim_{x\to-\infty} \tan(x)\ln(x)$ is of an indeterminate form for the purpose of applying L'Hospital's Rule.

T F (4) The limit $\lim_{x\to 0} \frac{1-\sin(x)}{tan(x)}$ is of an indeterminate form for the purpose of applying L'Hospital's Rule.

T F (5) If $f'(x) < 0$ on an interval, then f is increasing on that interval.

T F (6) Omitted.

T F (7) Define $f(x) = \tan(x)$ for $x < 0$ and $f(x) = x$ for $x \geq 0$, then 0 is an inflection point for f.

T F (8) A function cannot be both concave upward and decreasing on the same interval I.

T F (9) Suppose f'' is continuous near a critical point c, and suppose $f''(c) \geq 0$, then f has a local maximum at c.

T F (10) Let f be a differentiable function with $f(0) = 0$ and $f(100) = 100$. The there exists a number $x \in (0, 100)$ such that the tangent line of the graph of f at x is parallel to the y-axis.

T F (11) Omitted.

T F (12) If $f''(c) = 0$, then f has an inflection point at c.

Name: _____ Problem 2: _____/20

Problem 2 (20 points) Calculate the following limits. If they do not exist, then explain why. Provide all the details. If you need to apply L'Hospital's Rule, justify that it applies.

1. $\lim_{n\to 0} \frac{1-\sin(x)}{\cos(x)}$.

2. $\lim_{x\to+\infty} \left(\sqrt{x^4+50x+300}-x^2\right)$.

3. $\lim_{x\to 0} \frac{\sin(x)\sin\left(x^{-3}\right)}{\sqrt{\tan(x)}}$.

4. Omitted.

Name: _____ Problem 3: _____/20

Problem 3 (20 points) Two cars start moving from the same point. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?

Name: _____ Problem 4: _____/36

Problem 4 (36 points) Let $f(x) = x^{\frac{1}{3}}(x+4)$.

1. Find the domain of definition of this function.
2. Find all vertical and horizontal asymptotes, if any.
3. Find all intervals of increase or decrease, if any.
4. Find all local maximum and local minimum values, if any.
5. Find all absolute maximum and absolute minimum values, if any.
6. Find all intervals of concavity and the inflection points, if any.
7. Sketch the graph for f.

MAT 131 Spring 2018 Final Exam (Practice)

Name: **ID:** **Recitation Number:**

There are four problems with indicated values.

Show your work. Continue writing on the back of the pages if needed.

Do not tear-off any page(s).

No calculators, no cellphones, etc.

1	20	
2	16	
3	16	
4	16	
5	12	
6	20	
Total	100	

Name: _____ Problem 1: _____/20

Problem 1 (20 points) In each of the following statements, circle T if it is true and F if it is false. There is no need to show your work in this problem.

T F (1) The limit $\lim_{x\to 0^+} xe^x$ is of an indeterminate form for the purpose of applying L'Hospital's Rule.

T F (2) The limit $\lim_{x\to+\infty} x/\ln(x)$ is of an indeterminate form for the purpose of applying L'Hospital's Rule.

T F (3) If f is an odd function on the interval $[-10, 10]$, then necessarily $\int_{-1}^{1} f(x)\,\mathrm{d}x = 0$.

T F (4) If both $f(x)$ and $g(x)$ are continuous on $(0, 1)$, then $f(x) + g(x)$ is continuous on $(0, 1)$.

T F (5) omitted

T F (6) If a function is continuous on $[0, 1]$, then f must have a global maximum on $[0, 1]$.

T F (7) If a function f has an antiderivative F on $(0, 1)$, then F must be differentiable on $(0, 1)$.

T F (8) Omitted

T F (9) Omitted

T F (10) Omitted

Name: _____ Problem 2: _____/16

Problem 2 (16 points) Calculate the following limits. If they do not exist, then explain why. Provide all the details. If you need to apply L'Hospital's Rule, justify that it applies.

1. $\lim_{n \to +\infty} \frac{x}{\ln(x)}$

2. $\lim_{x \to 0^+} x^{\sqrt{x}}$

3. $\lim_{x \to +\infty} \left(1 + \sin \frac{3}{x}\right)^x$

4. $\lim_{n \to +\infty} \sum_{i=1}^{n} \frac{1}{n} \sqrt{\frac{i}{n}}$

Name: _____ Problem 3: _____/16

Problem 3 (16 points) Calculate the following derivatives. If they do not exist, then explain why. Provide all the details.

1. $y = x^{\sqrt{x}}$. Find $\frac{\mathrm{d}y}{\mathrm{d}x}$.

2. Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ where y satisfies the equation

$$e^y + xy = e.$$

3. $y = \int_{x+x^2}^{-x} t^3 \ln(t)\,\mathrm{d}t$. Find $\frac{\mathrm{d}y}{\mathrm{d}x}$.

4. Omitted

Name: _____ Problem 4: _____/16

Problem 4 (16 points) Calculate the following integrals. If they do not exist, then explain why. Provide all the details.

1.
$$\int \frac{x^2+1}{x}\,\mathrm{d}x$$

2.
$$\int_{-1}^{1} \frac{\sin(2x)\ln(1+x^2)}{1+\cos^2(x)}\,\mathrm{d}x$$

3.

$$\int_0^1 \sqrt[3]{x^2} - \sqrt{x^3}\,\mathrm{d}x$$

4.

$$\int \frac{\sin(2x)}{1+\cos^2(x)}\,\mathrm{d}x$$

Name: _____ Problem 5: _____/12

Problem 5 (12 points) Find the area of a plane region between curves $y = \sqrt{x}$ and $y = x^2$.

Name: _____ Problem 6: _____/20

Problem 6 (20 points) Let $f(x) = xe^{x^2-1}$.

1. Find the domain of definition of this function.
2. Determine if f is an odd function, or an even function, or neither.
3. Find all vertical and horizontal asymptotes.
4. Find all intervals of increase or decrease.
5. Find all local maximum and local minimum values.
6. Find all intervals of concavity and all inflection points.
7. Sketch the graph for f.

Textbook for MAT125, 126, 127, 131, and 132

You have several options regarding the textbook for your calculus course.

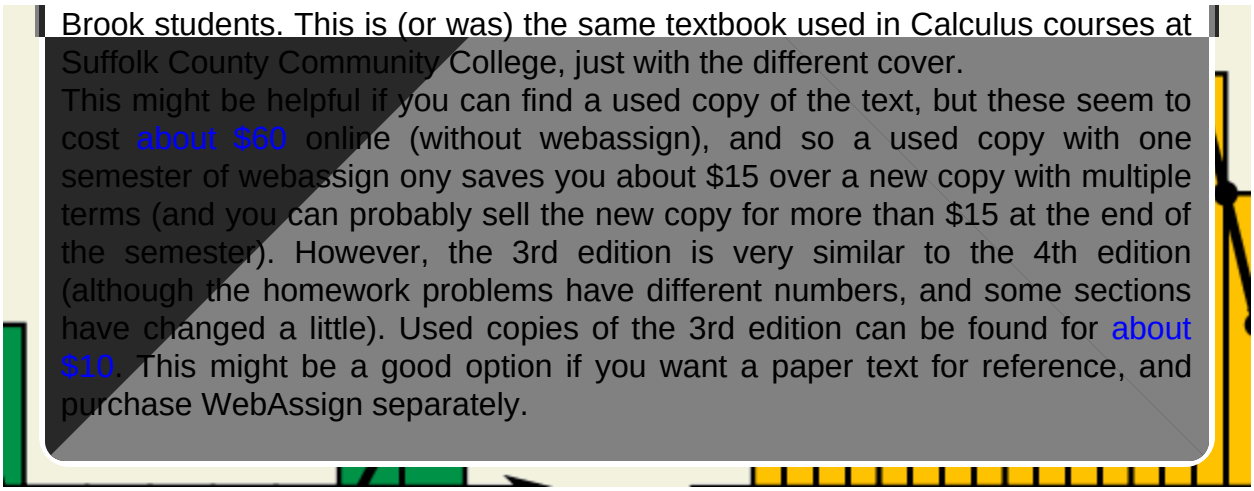
The text for MAT125, 126, 127, 131, and 132 is Single Variable Calculus(Stony Brook Edition 4), by James Stewart.
These courses also use WebAssign for homework problems and access to **WebAssign is required** in these courses.

Note that Webassign access is **free for the first two weeks** and **includes an electronic text**. So you don't have to do anything right away.

You can purchase the textbook and webassign together or separately; buying them together tends to be less expensive, but not always.
You have several options:

- **Buy a physical text and webassign access for several semesters**. You can purchase this directly from the publisher for $166.29.
- **Buy several semesters of Webassign access with an electronic text**. You can purchase this directly from the publisher for $125.00 or from Webassign for the same price.
- **Buy only one semster of access to Webassign, with an electronic text**. This can only be done through Webassign, and costs $94. This is a good option for students who are taking MAT132 and MAT127, but is typically not a good idea for students in MAT125 and MAT131 (because they usually also take MAT126 or MAT132 afterwards). Many students in MAT126 also take MAT127, in which case it would be better to purchase multi-term access; others stop with MAT126, and should buy only one semester.
- **Buy webassign without an e-book.** Students can buy the webassign-only access direct from WebAssign. In this case, the cost is $47 for a single term, or $65 for multiple terms.

If you don't buy the e-book with webassign, or a physical book from the publisher, the Stony Brook edition of the text is **identical** to the book (Stewart's Single Variable Calculus: Concepts, 4th ed, with WebAssign) **except for the cover** because we made a deal with the publisher to reduce the price for Stony



Brook students. This is (or was) the same textbook used in Calculus courses at Suffolk County Community College, just with the different cover.
This might be helpful if you can find a used copy of the text, but these seem to cost about $60 online (without webassign), and so a used copy with one semester of webassign ony saves you about $15 over a new copy with multiple terms (and you can probably sell the new copy for more than $15 at the end of the semester). However, the 3rd edition is very similar to the 4th edition (although the homework problems have different numbers, and some sections have changed a little). Used copies of the 3rd edition can be found for about $10. This might be a good option if you want a paper text for reference, and purchase WebAssign separately.

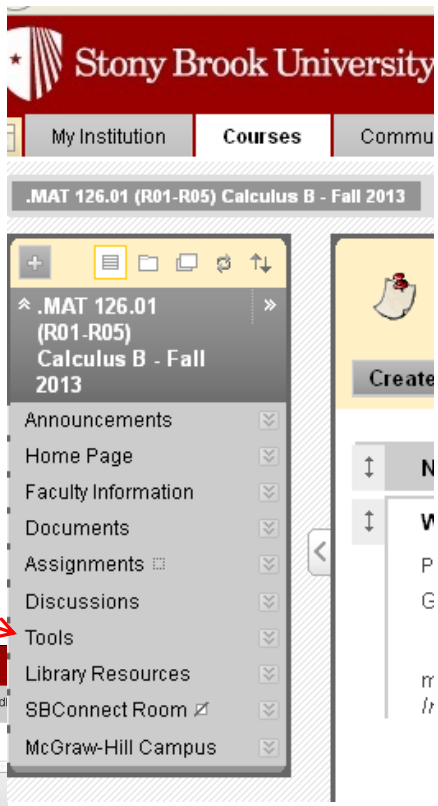
Using WebAssign – MAT 131

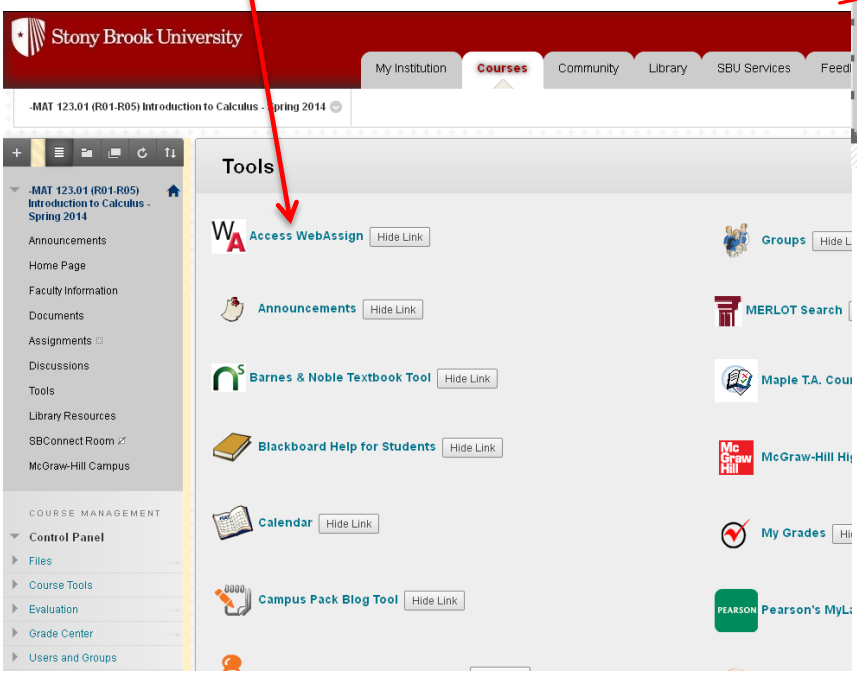
You'll be using WebAssign for your MAT 131 homework assignments. Here are some reminders and a short guide as to how to use WebAssign.

- If you are enrolled in MAT 131 class you already have a WebAssign account. You do not need a class key or any other code. If you haven't purchased WebAssign with your textbook or separately you will be prompted to "pay-up" when you enter the program. How you enter WebAssign is explained below.
- The assignment will usually be posted on the weekend for the upcoming week. It would be best to wait until the work involved in the WebAssign homework has been discussed in lecture before starting the assignment.
- Generally the assignments are due early Monday morning (usually 8:00 am) at the end of the week that the assignment was given. This is to avoid a "traffic jam" that results when assignments are due at night. The due date appears on the same line as the assignment.
- Your best bet to enter WebAssign from Blackboard (Bb) as follows:

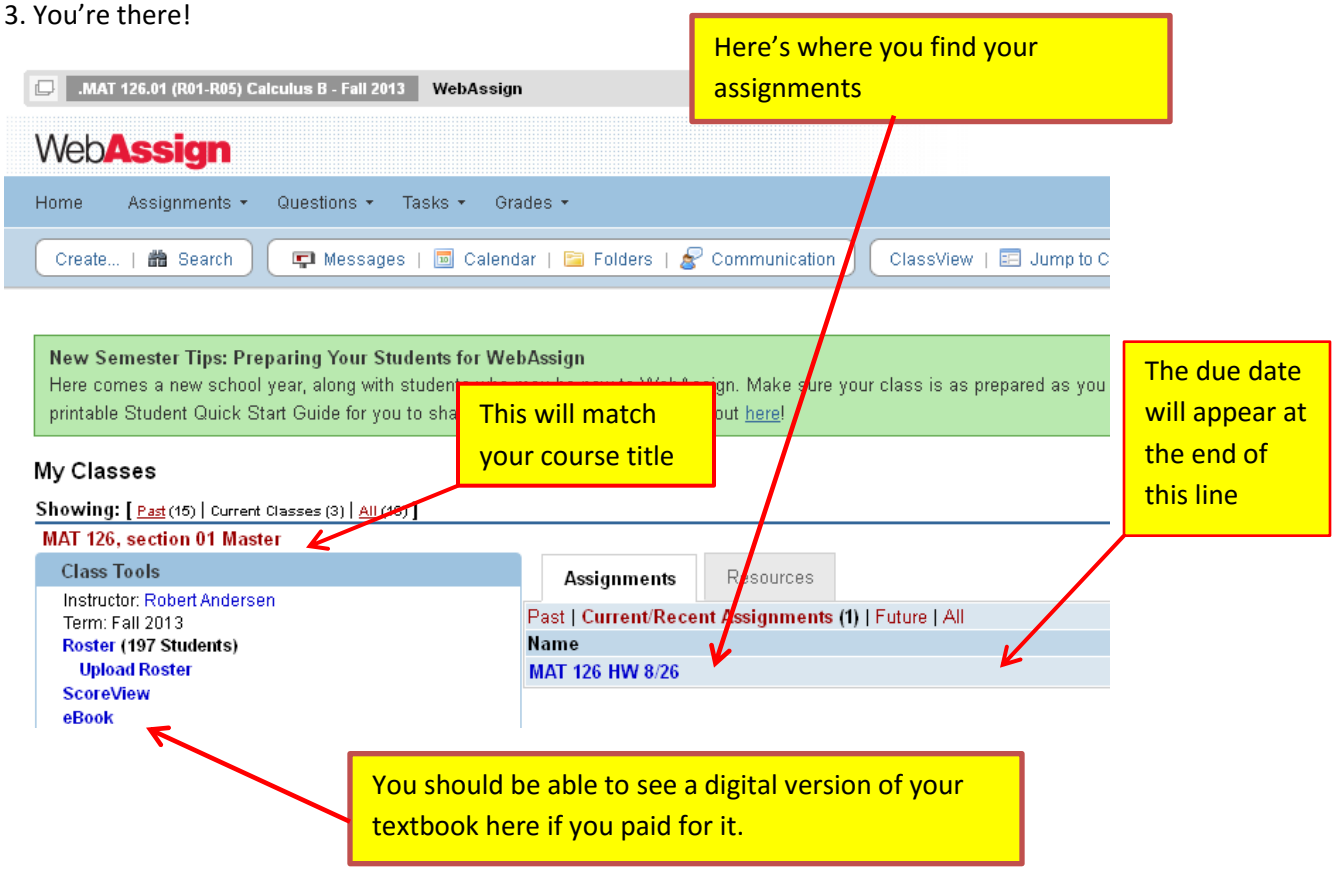
1. Once you get into Bb select "Tools"

2. Scroll up to "WebAssign on the upper left.





3. You're there!



- Click on the assignment you want.
- When you enter the assignment you'll see places for your answers. In some cases you select the answer from a list, in others you have to use a built-in formula editor. Some "tutorial" questions take you through the process step by step and you have to answer each part before going on to the next.
- Once you submit your answer, you are told whether or not your answer is correct. If it's wrong you have one more chance to get it right with no penalty. After that you have 3 more tries but each try reduces your score for that question by 20%. You have a total of 5 tries.