MATH 19 – Exam 1 Details

The first exam will take place in class on Thursday, October 3. You will have the whole class period to take the exam. The exam is closed notes and closed book. You are allowed a scientific or graphing calculator. You WILL NOT be permitted to use any other technology (such as calculators on phones) or other resources during the exam. **Please note that academic integrity violations will be taken seriously, and will be met with serious consequences.**

The exam covers sections 2.1-2.5 and 3.1-3.2. The topics you should know are:

- **2.1 Limits** – Know what a limit is conceptually and how to evaluate them (we can evaluate them algebraically, graphically, or from a table). Know that 0/0-indeterminate form means we need to factor and that (some nonzero #)/0 means there is an infinite limit (continued in Sec 2.2).

- **2.2 Infinite Limits and Limits at Infinity** – If you get (some nonzero #)/0 this means there is an infinite limit. You need to tell me which type of infinity it is. For example,

$$\lim_{x\to 1^-} \frac{x^2+8}{x-1} = \frac{9}{0} \approx \frac{9}{0.99-1} = \frac{9}{\text{small}-} = \text{big}- = -\infty.$$

  You also should know limits at infinity. For rational functions there are three different cases based on the leading terms in the numerator and denominator. An example when the numerator exponent is larger:

$$\lim_{x\to\infty} \frac{3x^2-5x+1}{2x+4} = \lim_{x\to\infty} \frac{3x^2}{2x} = \lim_{x\to\infty} \frac{3}{2}x = \frac{3}{2}\text{big}+ = +\infty.$$

  You should know how to find vertical asymptotes (they relate to infinite limits). You look for where the denominator is zero AND then prove that the limit as x approaches that value is an infinite limit (some nonzero #)/0.

  You should know how to find horizontal asymptotes (they relate to limits at infinity). Recall the three different cases.

- **2.3 Continuity** – Know the mathematical definition of continuity (3 criteria). Know what partition numbers are and how to make a sign chart.

- **2.4 The Derivative** – Big picture (many ways of saying the same thing):

$$\text{AROC from } x=a \text{ to } x=a+h \iff \text{slope of secant line through } (a, f(a)) \text{ and } (a+h, f(a+h)).$$

$$\text{IROC is the LIMIT of the AROC on smaller intervals (as } h\to 0) \iff \text{slope of tangent line at } x=a \iff \text{the derivative of } f \text{ at } x=a.$$

  Know the limit definition of the derivative.

- **2.5 Basic Derivative Rules** – The main thing from this section is the power rule. If you know how to take the derivative of $f(x) = x^3 - \frac{1}{\sqrt[4]{x}} + 6x + 8$ then you know everything about this section.
- **3.1 Compound Interest and** e – Know how to solve problems with continuous compound interest ($F = Pe^{rt}$). This involves using properties of logarithms.
- **3.2 Derivative of** e^x **and** $\ln x$ – All you need from this section is $\frac{d}{dx}(e^x) = e^x$ and $\frac{d}{dx}\ln x = \frac{1}{x}$.
- **Misc topics** – Know how to find the equation of the tangent line. Know how to find where the tangent line is horizontal.

To give you an idea of what to prioritize: about 25% of the exam will be weighted just towards taking limits (Sec 2.1 and 2.2). About 10-15% will involve finding asymptotes (Sec 2.2). About 15% will be weighted to continuity, partition numbers, and sign charts (Sec 2.3). About 10-15% will involve the limit definition of the derivative (Sec 2.4). About 25-30% will involve derivative rules + stuff with tangent lines (Sec 2.5 and 3.2). Only about 5% will be weighted to compound interest (Sec 3.1).

Study resources:

- Class notes, quiz 1-4
- **Exam 1 Practice (the actual exam will be very similar)**
- Extra practice: "Exam 1 Review" on MyLab Math – There are 60 questions from which you can practice. The frequency of problem types is NOT related to how much the exam will weight that type (there are a lot of questions about compound interest, but it's only worth 5% on the exam). You should identify where your weaknesses are and spend time on those problems.
- Office hours: Tues & Fri 12-1:30pm. Other times by appointment.
- Help sessions: Mon-Thurs 5-7pm (I'll be there Mon 5-6pm).