MATH 3100 – Learning objectives to meet for the final exam

The final exam is **cumulative**. In particular, succeeding on the exam will require that you remember what we covered before Spring Break. Please refer back to the earlier exam study guides for that material. The guide below (apart from the "what to expect on the final exam" section) concerns only the concepts discussed after our transition to an online format.

I will **not** examine you on Maclaurin polynomials, or on Taylor's theorem and its applications.

Due to the special circumstances we find ourselves in, your final exam will **not be timed or proctored**. The exam will also be **open book/open notes/open HW solutions/open videos from our class**. However, you **may not** discuss the exam questions with your others, and you **may not** look up answers in outside sources.

You will have 24 hours to turn in the exam, starting from Wednesday, May 6, 12 PM Eastern Time. The exam will be distributed by email, via Piazza; **you will need to scan your solutions and upload them through Gradescope**.

What to be able to state (since last exam)

Basic definitions

You should be able to give complete and precise definitions of each of the following items:

- Absolute convergence and conditional convergence
- Power series centered at 0
- Power series centered at a
- Domain of convergence of a power series
- Radius of convergence of a power series
- Pointwise convergence of a sequence of functions f_n to f on a set A
- Distance $d(f, g)$ between two functions f and g on a set A
- Uniform convergence of a sequence of functions f_n to f on a set A
- Maclaurin series for $f(x)$

Big theorems

Be familiar with all of the following theorems, making sure that you can give full statements for those not already spelled out below. For results proved in class, describe the components and main ideas of the proof.

- A series that converges absolutely also converges
- Alternating series test

- Ratio test for series
- Key lemma version 2: If $\sum_{n=0}^{\infty} a_n x^n$ converges at $x = c$, it converges absolutely for all x with $|x| < |c|$
- Characterization of the domain of convergence of a power series centered at 0 (Proposition 2.4.4)
- If $\sum_{n=0}^{\infty} a_n x^n$ is a power series with radius of convergence $R > 0$, then within $(-R, R)$, one can differentiate and integrate the corresponding function term-by-term (see Theorems 3.1.14 and 3.1.15)

What to expect on the final exam

The format of the final exam is similar to your midterms, but the length is *approximately double* that of a single exam. **Among other things**, there will be ...

- A problem asking you to establish the value of a limit using the definition of a limit.
- At least one multipart problem asking you to test concrete examples of series for convergence/divergence
- At least one problem asking you to determine the domain and/or radius of convergence of given power series
- At least one problem asking you to determine if certain sequences of functions converge pointwise and/or uniformly

Extra practice problems

1. §§2.3: 2, 3(a,d,e)

2. §§2.4: 1(a,c,d,g,i,j), 4

3. §§3.1: 4(a,d,f), 6(a,b,c), 7, 9(a)