Final Exam Information

Math 126

The exam will be cumulative, but will emphasize topics that we studied in the last month or so—especially partial derivatives and double integrals. Of course, these topics require understanding of previous topics, especially derivatives, integrals, and 3D geometry. The exam will also include questions on topics from earlier in the course.

Derivatives

- Understand derivatives as instantaneous rate of change.
- Differentiate common functions, such as $f(x) = c$, $f(x) = x^n$, $f(x) = e^x$, $f(x) = \ln(x)$, $f(x) = \sin(x)$, $f(x) = \cos(x)$, $f(x) = \tan(x)$.
- Apply the constant multiple, sum/difference, product, quotient, and chain rules for derivatives.

Integrals

- Know the following antiderivatives: $\int c\,dx$, $\int x^n\,dx$, $\int \frac{1}{x}\,dx$, $\int e^x\,dx$, $\int \sin(x)\,dx$, $\int \cos(x)\,dx$
- Demonstrate understanding of properties of integrals.
- Use substitution and integration by parts to evaluate integrals.
- Set up and evaluate integrals representing the area between the graphs of two functions, the length of the graph of a function, and a volume of revolution.
- Be able to apply the fundamendal theorem of calculus (both versions).
- Identify whether an improper integral converges or diverges.

Sequences and Series

- Explain what a sequence is, determine whether a given sequence converges or diverges, and give examples of convergent and divergent sequences.
- Identify and give examples of geometric series, and evaluate finite and infinite geometric sums.
- Explain how a series is different from a sequence.
- Use the integral test to determine whether a sequence converges or diverges.
- Explain what a power series is, and identify the center and radius of convergence of a power series.
- Find power series (such as Taylor series) that converge to various functions.
- Use substitution, derivatives, and antiderivatives to modify a given power series, obtaining a new power series that converges to a function.
- Find a Taylor (and Maclaurin) series for a specified function, and use these series to approximate the function near a point.

Multivariable Functions

- Understand how a function of two variables relates to its graph and contour plot.
- Describe what a vector is, and what it means for two vectors to be equal.
- Perform operations on vectors, including addition and scalar multiplication.
- Compute the dot product of two vectors, state how the dot product relates to the angle between two vectors, and scalar and vector projections.
- Compute the cross product of two vectors, and use the cross product to find a vector orthogonal to two given vectors.
- Determine the equation of a line between two points in space, in both parametric and vector form.
- Determine the equation of a plane in space from a set of criteria (such as three given points, or a point and a normal vector).
- Compute partial derivatives. Interpret a partial derivative as rates of change in a particular direction.
- Find the tangent plane to the graph of a multivariable function at a given point. Use the tangent plane linearization to approximate values of the function near the given point.
- Compute the gradient and directional derivatives, and interpret them as rates of change in a particular direction.
- Understand double integrals as signed volume under the graph of a surface.
- Convert a double integral over a rectangular or triangular region to an iterated integral.
- Evaluate iterated integrals by evaluating the inner integral, followed by the outer integral.