

Math 173-01

Final Exam Information

The final exam is Monday, May 13, 10am–11:50am, in Room 2625. Special office hours during finals week:

- Monday, May 13: 12:00pm – 1:00pm
- Tuesday, May 14: 10:00am – 12:00pm
- Wednesday, May 15: 10:00am – 12:00pm

Skills Checklist

I. Constant Vectors

1. Find a vector given an initial and terminal point.
2. Find the magnitude of a vector and normalize vectors.
3. Find a vector with a given direction and magnitude.
4. Perform the operations of addition, subtraction, scalar multiplication, dot products, and cross products on vectors.
5. Determine if vectors are parallel or perpendicular (orthogonal).
6. Find the angle between two vectors.
7. Find the projection of one vector onto another.
8. Find a vector orthogonal to two given vectors.
9. Find a set of parametric equations for a line in space. Get a direction vector from a set of parametric equations for a line.
10. Given three points or a point and a normal vector, find an equation for a plane. Given an equation of a plane, find points and a normal vector.

II. Vector-Valued Functions

1. Find the domain and sketch the graph of a vector-valued function.
2. Perform operations on vector-valued functions, e.g. find limits, differentiate, integrate, antidifferentiate, etc.
3. Given a position, velocity, or acceleration vector, find the other vectors. Solve projectile motion problems.
4. Find the unit tangent vector and the principal unit normal vector.
5. Find the arc length of a space curve.

III. Functions of Several Variables

1. Find the domain and range of a multi-variable function.

2. Find limits of multi-variable functions. You may need to use algebraic techniques such as factoring, multiplying by the conjugate, etc. You may need to convert to polar coordinates. You will NOT need to use the formal definition of limit.
3. Use the two-path test to show that a limit does not exist.
4. Find partial derivatives and mixed partial derivatives of all orders.
5. Use the chain rule for functions of several variables.
6. Find the gradient vector for a multi-variable function.
7. Use the gradient vector to find directional derivatives and directions of maximum increase and decrease.
8. Use the gradient vector to find tangent planes and normal lines.
9. Use the second partials test to find relative extrema for a two-variable function.
10. Use Lagrange multipliers to solve a constrained optimization problem.

IV. Multiple Integration

1. Evaluate iterated integrals.
2. Sketch the region of integration and reverse the order of integration for double integrals.
3. Set up and evaluate double integrals in rectangular and polar coordinates.
4. Find the area of a plane region, find the center of mass of a thin plate, find the average value of a two-variable function.
5. Be familiar with common surfaces in space, e.g. spheres, paraboloids, cones, planes, cylinders, etc.
6. Set up and evaluate triple integrals in rectangular, cylindrical, and spherical coordinates.
7. Find the volume of a space region, find the center of mass of a solid, find the average value of a three-variable function.

V. Line Integrals

1. Evaluate line integrals.
2. Find the scalar potential function for a conservative vector field.
3. Use the potential function to evaluate the line integral of a conservative field.
4. Use Green's theorem to evaluate a 2D line integral.