This review sheet should be a guide on major topics and concepts that will be tested on the second exam. For practice problems, please revisit your homework assignments or complete additional exercises from the textbook.

Taylor Series and Remainders (Chapters 11.10-11.11)

You should be able to:

1. Calculate the first few terms of the Taylor series of a function at a specific point.
2. Recall the formulas for series representations of common functions, e.g. e^x, $\sin(x)$, and $\cos(x)$.
3. Using knowledge of the $n+1$st derivative of a function, estimate the error $\mathcal{E}_n(x) = f(x) - T_n(x)$ between a function f and its nth degree Taylor polynomial T_n. In the book, this is called Taylor's inequality.
4. Under certain conditions (perhaps, by having knowledge of the size of a function's derivatives), show that the Taylor series of a function $f(x)$ converges to that function on its domain.

Vectors and vector operations (Chapters 12.1-12.4)

You should be able to:

1. Distinguish scalar quantities from vectors.
2. Use and apply the following vector operations, as well as give geometric interpretations of each:
   (a) vector addition and subtraction
   (b) scalar multiplication
   (c) dot product
   (d) cross product
   (e) vector projection
3. Find a unit vector in the direction of a given vector.
4. Compute the angle between two vectors.
5. Test if two vectors are parallel or perpendicular.
6. Use the vector projection to find the parallel and perpendicular components of a given vector.
7. Work with the standard basis vectors $\vec{i}$, $\vec{j}$, and $\vec{k}$ in $\mathbb{R}^3$.
8. Compute the area of the parallelogram (or triangle) spanned by two vectors.

Surfaces (Chapters 12.5-12.6)

You should be able to:

1. Find the normal vector of a plane given an equation for that plane.
2. Solve for the equation of a plane given some information about that plane, e.g. three points on the plane, or a point and a normal vector.
3. Recognize the equations and/or graphs of various quadric surfaces, i.e. paraboloids, hyperboloids, ellipsoids, and cones.
4. Sketch and identify the shapes of different cross-sections (traces) of surfaces and solve for their equations algebraically.

Multivariable Functions (Chapters 14.1-14.3)

You should be able to:

1. You should know what functions/domains and ranges are and, given a rule, be able to determine the natural domain of a function.
2. Interpret a contour/level curve plot of a function.
3. For very basic examples, sketch the graph of a function.
4. Determine if a limit of a multivariable function does not exist by considering different curves through the limit point.
5. Use the squeeze theorem (and other results) to show that the limit of a function does exist (if it does) and determine its limit.
6. Explain the criteria for a multivariable function to be continuous.
7. Calculate the partial derivatives of a function.