

# Math 120: Calculus of Functions of Several Variables

## List of Topics Fall 2015

Below are the sections of Stewart's Calculus, in order that we cover them in Math 120 during Fall 2015 (see the current [Schedule](#) for a timeline of the topics). Next to each section number is a description of the main topics covered. The third column lists side topics that we skip or delay until later sections. Topics that we skip entirely will not appear on the exams, though your instructor may use them for examples.

CHAPTER 12		
SECTION	MAIN TOPICS	SKIPPED TOPICS
12.1	3-D geometry, vertical and horizontal planes, spheres, intersections of surfaces.	None.
12.2	Vectors, length, addition, scalar multiplication.	None.
12.3	Dot product, angle between vectors, projections.	Direction cosines.
12.4	Cross product and its properties, area of parallelogram, volume of parallelepiped.	None.
12.5	Equations of lines and planes, intersections between lines and planes (either with either - or recognizing that they are parallel), distance point to plane.	Everything after example 8 (distance between skew lines and between two planes).
12.6	None.	Skipping this section entirely. Read it if you need practice with 3-D geometry.
CHAPTER 13		
SECTION	MAIN TOPICS	SKIPPED TOPICS
13.1	Vector functions, space curves.	None.
13.2	Derivatives and integrals of vector functions, velocity, tangent line to a curve.	None.
13.3	Arc length.	Everything after example 1 (curvature and binormal vectors).
13.4	Velocity and acceleration.	Everything after example 6 (components of acceleration).
CHAPTER 14		
SECTION	MAIN TOPICS	SKIPPED TOPICS
14.1	Multivariable functions, graphs of surfaces, level curves, level surfaces.	None.
14.2	Limits and continuity: you must be able to tell when a limit does not exist, and use squeeze theorem, polar coordinates, or some other technique to show when it does.	You do not need to know any deltas and epsilons (though you may use them if you like).
14.3	Partial derivatives.	Implicit differentiation is delayed: it will be covered in section 14.5.
14.4	None.	We skip this section - but we cover tangent planes later, in section 14.6, so they will come up.
14.5	The chain rule, implicit differentiation.	None.

14.6	Directional derivatives, gradient and its properties, tangent planes.	None.
14.7	Max/min: find and classify critical points, find absolute max and min of a function, if it exists (with or without constraints).	None.
14.8	None.	Skipping this section entirely, though you may wish to read it on your own, especially if you are interested in studying social sciences or economics.

### CHAPTER 15, part I: sections 15.1 - 15.5 (rest later)

SECTION	MAIN TOPICS	SKIPPED TOPICS
15.1	Double integrals, geometry, rectangular regions, Fubini's theorem.	You do not have to know Riemann sums or approximations, the geometry part of this section is just to realize that double integrals are related to volume.
15.2	Double integrals over general regions, switching order of integration.	You do not need to remember types of regions, so long as you can integrate over them.
15.3	Double integrals in polar coordinates.	None.
15.4	None.	Skipping this section entirely.
15.5	None.	Skipping this section, though surface area will come up later in section 16.6.

### CHAPTER 16, part I: sections 16.1 - 16.8 (rest later)

SECTION	MAIN TOPICS	SKIPPED TOPICS
16.1	Vector fields, gradient fields. Take a look at <a href="#">Physics in Math 120</a> , to see some real world examples of fields.	You do not need to know any physics for the exams.
16.2	Line integrals of functions, and of vector fields (take care, those are quite different).	None.
16.3	The fundamental theorem of line integrals, conservative fields, path independence.	None.
16.4	Green's theorem, when and how to use it, and what to do when the conditions are not satisfied: wrong curve orientation, curve is not closed, or the field has a singularity inside (the last case is solved with extended Green's).	None.
16.5	Div and curl, "uncurling" a field (given $G$ , find $F$ so that $\text{curl}(F) = G$ , if possible), normal form of Green's theorem.	None.
16.6	Parametric surfaces, tangent planes, surface area.	None.
16.7	Surface integrals of functions, and of vector fields (take care, those are quite different).	None.
16.8	Stokes' theorem, surface independence.	None.

### CHAPTER 15, part II: sections 15.6 - 15.9

SECTION	MAIN TOPICS	SKIPPED TOPICS
15.6	Triple integrals, changing order of integration.	None.
15.7	Triple integrals in cylindrical coordinates.	None.
15.8	Triple integrals in spherical coordinates.	None.
15.9	None.	Skipping this section entirely.

## CHAPTER 16, part II: section 16.9

SECTION	MAIN TOPICS	SKIPPED TOPICS
16.9	Divergence theorem, when and how to use it, and what to do when the conditions are not satisfied: wrong surface orientation, surface is not closed, or the field has a singularity inside.	None.