Calculus III — table of dependencies among topics

Note: Topics are listed according to sections in which they are covered in the textbook [Calculus (Early transcendentals) by J. Stewart, 8th Ed.]. Topic titles do not always coincide with the titles of the respective sections in the textbook.

Section number	Topic	Uses material from section
12.2	Vectors: sum, difference; unit vectors; i , j , k	Review
12.3	Dot product; projections	Review
12.4	Cross product; making $\vec{\mathbf{c}} \perp \vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$	Review
12.5(1)	Equations of lines	Review
12.5(2)	Equations of planes	Review
12.6(1)	Parametric equations of ellipses and hyperbolas	10.1 (Calc II)
12.6(2)	Cylindrical surfaces	
13.1	Vector functions	10.1 (Calc II)
13.2	Derivatives, integrals of vect. functions; tangent lines	3.4^1 (Calc I), 13.1
13.3(1)	Arclength	13.2
13.3(2)	Curvature	12.4, 13.2
13.4	Velocity and acceleration in motion on a curve	12.2, 12.3, 12.4, 13.2, 13.3(1,2)
14.1	Function of several variables ²	12.6(2)
14.2	Limits of functions of several variables	
14.3	Partial derivatives	14.2
14.4	Tangent planes and linear approximations	12.5(2), 14.3
14.5	Chain Rule for functions of several variables	14.3
14.6(1)	Directional derivative; level curves	14.3, 14.5
14.6(2)	Gradient	12.3, 14.3, 14.6(1)

 $^{^1}$ Good working knowledge of this material will be needed throughout this entire course. 2 This material will be used in all sections in the remainder of the course.

Section number	Topic	Uses material from section
14.7	Maxima, minima, and saddle points	$12.3, \ 14.6(1,2)$
14.8	Conditional extrema and Lagrange multipliers	$12.2, \ 12.6(1), \ 14.6(1,2)$
15.1	Double integrals over rectangular regions	14.1, 14.3
15.2	Double integrals over general regions	15.1
15.3	Double integrals in polar coordinates	10.3 (Calc II), 15.1, 15.2
15.5^{3}	Applications of double integrals	$15.2, \ 15.3$
15.6	Triple integrals	15.1, 15.2
15.7	Triple integrals in cylindrical coordinates	12.6(2), 15.3, 15.6
15.8	Triple integrals in spherical coordinates	15.6
15.9	Change of variables in multiple integrals; Jacobian	12.4, 14.3, 14.4, 15.3, 15.8
16.64	Parametric surfaces and their area	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
16.1	Vector fields	12.2
16.5	Curl and divergence	12.3, 12.4, 14.6(2), 16.1
16.2	Line integrals	10.1, 12.3, 12.6(1), 13.3(1), 15.5
16.3	Fundamental Theorem of Calculus for line integrals	$5.3^5 \text{ (Calc I)},$ 14.5, 14.6(2), 16.1, 16.5, 16.2
16.4	Green's Theorem	$12.3, \ 15.2, \ 16.5, \ 16.3$
16.7	Surface integrals	12.3, 14.1, 15.5, 16.6, 16.3
16.86	Stokes' Theorem	12.3, 12.4, 16.5, 16.3, 16.4, 16.7
16.9	Gauss' (Divergence) Theorem	$12.3, \ 15.6, \ 16.5, \ 16.7$

 ³ Section 15.4 is skipped, since much of its material will be covered in 16.6.
⁴Here and after 16.1, sections will be covered in an order different than that in the textbook.
⁵This is the Fundamental Theorem of Calculus. This and the remaining sections of the course will generalize it to 2D and 3D.
⁶This section will be covered only briefly.