SYLLABUS FOR **MATH 2500**
Text: Hass, Weir, and Thomas, *University Calculus*
Fall, 2007

Section	Topics and Recommended Exercises	# Days
	Chapter 10: Vectors and the Geometry of Space	
	Review dot product, cross product, lines and planes; while discussing parametric equations of a line, include a treatment of the parametric equations of a cycloid based on vector addition (cf. pp. 607–08, but note angle t is directed incorrectly)	3
	Chapter 11: Vector-Valued Functions and Motion in Space	
11.1	Vector Functions and Their Derivatives (Use the cross-product rule to derive Kepler's Second Law: In a central force field, $\mathbf{r}(t) \times \mathbf{v}(t)$ is constant; so the trajectory is planar and sweeps out area at a constant rate.)	2
	§11.1: #1, 4, 7, 9, 11, 21, 23	
11.2–11.3	Integrals of Vector Functions, Arc Length in Space	1
	§11.2: #1, 7, 9, 19, 24; §11.3: #1, 5, 7, [12], 19	
	Additional and Advanced Exercises: #1, 2	
	Chapter 12: Partial Derivatives	
12.1–12.2	Functions of Several Variables, Limits and Continuity in Higher Dimensions (Emphasize graphs versus level sets, soft-pedal subtle limit notions)	1.5
	§12.1: #3, 5, 7, 9, 13–18, 21, 22, 27, 33, 35, 37, 38	
12.3	Partial Derivatives	1.5
	§12.3: #5, 7, 12, 16, 25, 26, 43, 51, 57, 59, 60, 65, 66, 69	
12.4	The Chain Rule	2
	§12.4: #3, 7, 9, 11, 15, 27, 29, 39, 40, 42, 47, [49, 50]	
12.5	Directional Derivatives and Gradient Vectors	1
	§12.5: #1, 3, 5, 7, 9, 14, 17, 20, 25, 28, 31	
12.6	Tangent Planes and Differentials	2
	§12.6: #1, 5, 8, 12, 21, 23, 24, 33, 35, 39, 45, 49	
12.7	Extreme Values and Saddle Points	2
	§12.7: #1, 5, 14, 17, 19, 23, 35, 39, 47	
12.8	Lagrange Multipliers (Do one constraint only.)	2
	§12.8: #1, 5, 7, 9, 10, 11, 17, 25, 27, 30, [43, 44]	
	Additional and Advanced Exercises: #3, 8, 13, 19	

Chapter 13: Multiple Integrals

13.1–13.2	Double and Iterated Integrals over Rectangles; Double Integrals over General Regions	3
	§13.1: #1, 5, 7, 15, 19, 23, 25; §13.2: #1, 3, 7, 11, 12, 13, 17, 19, 25, 28, 31, 35, 38, [54, 55]	
13.3–13.4	Area by Double Integration; Double Integrals in Polar Form (Include "review" of §9.1.)	3
	§13.3: #3, 9, 11, 13, 16, 18; §13.4: # 3, 7, 9, 12, 13, 18, 23, 25, 26, 31, 32	
13.5	Triple Integrals in Rectangular Coordinates	1
	§13.5: #9, 14, 21, 25, 29, 30, [47]	
13.6	Moments and Centers of Mass	1
	§13.6: #4, 13, 21, 25, [35, 36, 37]	
13.7	Triple Integrals in Cylindrical and Spherical Coordinates	2
	§13.7: #1, 11, 12, 15, 19, 25, 37, 40, 43, 47, 53, 62, 65, 74	
	Additional and Advanced Exercises: #2, 7, 11, 15, 26	

Chapter 14: Integration in Vector Fields

14.1–14.2	Line Integrals; Vector Fields, Work, Circulation, and Flux	2
	§14.1: #1–8, 11, 23; §14.2: #1, 5, 7, 12, 15, 23, 25, 27, 43	
14.3	Path Independence, Potential Functions, and Conservative Fields	2
	§14.3: #1–6, 8, 9, 11, 14, 19*, 22, 25, 30, [38]	
14.4	Green's Theorem in the Plane	2
	§14.4: #3, 5, 7, 11, 16, 22, 23, 26, 33, [34]	
14.5–14.6	Surfaces and Area; Surface Integrals and Flux (If pressed for time, limit your surface integrals to subsets of planes, cylinders, and spheres, and derive $d\sigma$ directly.)	2
	§14.5: #[1], 5, 7, 11, 13, 17, [23]; §14.6: #2, 3, 5, 8, 17, 20, [21], 31, 32, 43	
14.7	Stokes' Theorem	2
	§14.7: #2, 3, 5, 9, 10, 21, [23], 26	
14.8	The Divergence Theorem and a Unified Theory	2
	§14.8: #1, 2, 5, 6, 8, 11, 13, 17, [21], 22, [27, 29, 30]	
	Additional and Advanced Exercises: #3, 5, 9, 13, 16, 19	

This syllabus allows 5 days for tests and review (based on a 45-day semester). Problems listed in brackets are best saved for the better students, as are the recommended "Additional and Advanced Exercises."

*The instructions preceding these exercises are garbled. The domains are **not** simply connected (except in the case of #22), but, nevertheless, all one needs to do is **find** a potential function.