

# Mathematics 3 – Term Syllabus

UPC - 2016

Based on *Calculus*, Stewart 7ed

Lecture	Sections	Topic
Day 1	Introduction	Course overview, expectations for pre-calculus material, statement of one of the fundamental problems (e.g. finding tangent lines to curves)
Day 2	1.1 - 1.3	Review: Manipulating functions. Properties of functions: domain, range, intercepts, increasing, decreasing. Even and odd functions.
Day 3	1.4-1.6	Review intuitive notion of limits, numeric and graphical estimations.
Day 4	1.7	The $\epsilon - \delta$ definition of the one-sided and two-sided limits. Link to intuition from numerical estimation, estimates from graphs, etc. Demonstrations may include showing that limits exist for (specific) linear functions, or showing that a limit doesn't exist at a jump discontinuity, etc.
Day 5	1.7	More $\epsilon$ s, more $\delta$ s. Work up to showing that limits exist (and calculating them) for $y = ax + b$ , $y = ax^2$ .
Day 6	1.8 (1.6)	Definition of continuity via limits. Discussion of jump discontinuities and removable discontinuities using the definition of limits. Review evaluating (some) limits using algebraic techniques.

Day 7	2.1 - 2.3	Introduction of the approximation of the tangent line by secant lines. Introduce the notion of the derivative via the idea of the rate of change. Development of the derivative linking the limit of the secant lines to the formal definition of the derivative (both forms).
Day 8	2.3 - 2.4	Power, Product, and Quotient rules, special derivative formulae. Feeling good about the class? - prove $\frac{d}{dx}x^2 = 2x$ .
Day 9	2.5, 2.6	Chain rule review, implicit Differentiation, derivatives of inverse trig functions as examples.
Day 10		No new material since midterm 1 was likely the night before. Use this class to introduce some of the basic problems in applications of derivatives or continuation of implicit differentiation.
Day 11	2.8	Related Rates
Day 12	2.8	Harder Related Rates
Day 13	3.1 - 3.2	Critical points and relation to relative maxima and minima.
Day 14	3.3	Concavity and inflection points
Day 15	3.4	Limits as $x$ becomes unbounded and limits where $f(x)$ becomes unbounded. Horizontal and Vertical asymptotes.
Day 16	3.5 - 3.6	Bring together all the pieces into a broad curve sketching toolkit.
Day 17	3.7	Relative and absolute extrema.
Day 18	3.7	Optimization
Day 19	2.7 and 3.7	Applications of optimization to other fields
Day 20	3.9	Anti-differentiation and indefinite integrals.

Day 21	4.1 - 4.2	Definite integrals, interpretation as areas, Riemann sums
Day 22	4.2	More Riemann sums, more definite integrals!
Day 23		No preparation due to midterm 2. Use this class to motivate and introduce the Fundamental Theorem of Calculus or to continue Riemann sums.
Day 24	4.3	FTC!
Day 25	4.4, 4.5	Area under a rate function as net change, introduce $u$ -substitution as the FTC applied to the chain rule, basic examples.
Day 26	4.5	$u$ -substitution and introduce integration by parts
Day 27	4.5	Integration by parts