Calculus III – Math 243
University of Hawai'i at Mānoa
Spring 2017

Meetings: MWF 11:30am–12:20pm, Keller 303

Lecturer: Robert Harron Email: rharron *at* math.hawaii.edu
Office: Keller 407 Office Hours: to be determined

Course website: http://math.hawaii.edu/~rharron/teaching/math243s17/

Textbook: *University calculus: alternate edition*, by Hass, Weir, and Thomas

Official description: Vector algebra, vector-valued functions, differentiation in several variables, and optimization. Pre: 242 or 252A, or consent.

Unofficial description: This course is like Calc. I for functions of more than one variable and for vector functions of one variable. In Calc. I, you might study the function telling you the temperature, T, at a location as a function of time, t. Maybe you want to know where the function has a maximum, where it has a minimum, how fast the temperature is changing, etc. You learned how to use derivatives to answer such questions. Now, what if you want to study the temperature not just at one location, but over some region, like a city, i.e. not just as time, t, varies, but also as the position changes? You get a function $T(x, y, t)$ of *three* variables. In this course, we will develop methods to answer max/min questions, etc. about such functions. Another type of situation one studies in Calc. I is, say, the height of a rock thrown into the air as a function of time. But what if instead of just tracking the height of a rock, you had a flying drone that could move up and down, side to side, forwards and backwards. To keep track of its position as a function of time, t, you need to know about *three* functions: in addition to how high it is (measured by $z(t)$), also, say, its coordinates x and y measuring above which point on the ground it is. We will bundle that information together into what we call a 'vector function' of one variable, i.e. a function $\mathbf{r}(t) = (x(t), y(t), z(t))$ whose value at a given time is a three-dimensional vector giving the position of the drone in 3D space. We will then develop methods to determine, for instance, the velocity of the drone at a given time, as well as things like how far the drone has travelled, and how 'curved' its path is. If you're wondering about integrating a function of several variables (which would allow you to determine the *average* temperature over some region), or you're wondering about what calculus can say about a vector function of *several* variables (spoiler alert: it can allow you to compute the amount of water flowing through a pipe, or relate Gauss' law in electromagnetism to Coulomb's inverse-square law), that is the focus of Calc. IV (and is developed further in Math 442).

Assignments: There will be weekly assignments. Problems will be posted after each lecture, then bundled together and due at a specified time each week. Only a subset of the questions will be graded.

Exams: There will be two midterms during class time and a final during the usual exam period:

Midterm I:	Friday, Feb. 17, in class
Midterm II:	Monday, Mar. 20, in class
Final:	Friday, May 12, 12:00pm–2:00pm

Grading scheme:

Homework	20%	Midterm I	20%	Final	40%
		Midterm II	20%		