MATH 281.

This is an introduction to vector calculus and covers the differential calculus. Topics include: The Cross Product, Equations of Lines and Planes, Cylinders and Quadratic Surfaces, Vector Functions and Space Curves, Derivatives and Integrals of Vector Functions, Arc Length, Motion in Space, Velocity and Acceleration, Limits and Continuity, and Partial Derivatives, Tangent Planes and Linear Approximations, The Chain Rule, Directional Derivatives and the Gradient Vector, Maximum and Minimum Values, Taylor and Maclaurin Series [this revisits material from Math 253 and is related to min/max problems and the best linear approximation], Lagrange Multipliers.

The underlying geometry can be stressed - that one is making quantifiable many of the basic concepts introduced in previous courses (perhaps). In particular, the geometry of the gradient plays a central role. The last few weeks involve many word problems to use the optimization methods that have been introduced. There are very few (or no) rigerous proofs. But lots of motivivation and picture drawing is essential.

MATH 282.

This continues the discussion of vector calculus and treats the integral calculus. Topics include: Double integrals over rectangles, Iterated integrals, Double integrals in Polar Coordinates, Applications of double integrals, Surface area, triple integrals in rectangular, cylindical, and spherical coordinates, change of variables (areas of ellipses, volumes ellipsoids, etc), vector fields, line integrals, fundamental theorem line integrals, arc length integrals, Greens theorem, Gauss's theorem, Stokes Theorem, conservative vector
fields.

Again, lots of pictures and as much motivation as possible. I actually prove Greens theorem (for relatively simple regions) to show where the signs come from. And I discuss the standard 1 and 2 forms that have a singularity at the origin that indicate when Greens, Gauss's, and Stoke's theorems can fail if the fields in question are not defined everywhere on the region.

Both courses are primarily "how to compute courses". But I try to provide as much motivation as possible and work on cognitative skills - decoding word problems into mathematical computations. Stewart is a good text for that. It is at a suitable level for the students - their linear algebra skills are still rather limited and they often need a bit of brush up on the trignometric functions - derivatives and integrals.

The goal of both courses is to equip students either to proceed in mathematics or to use their understanding in other courses.