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Supporting applied content with open education technologies

Almost every science student takes a course in either calculus or linear algebra. Often, the curriculum for these courses is designed around the perceived need to have students write supervised exams, with all computations done by hand. (If the student is lucky, they will be allowed a scientific calculator.) Sometimes there is a lab component, but it often involves expensive proprietary software that students cannot access from home.

This significantly limits the amount and types of applied content that we can include in these large service courses – courses that would better serve our science students (and even math majors) if they included relevant applied content.

I have been slowly introducing computational components to both calculus and linear algebra courses, using Python (and SymPy, which provides a fairly user-friendly interface for basic tasks). To avoid burdening students with installing Python on their own computers, I provide two access points: Jupyter notebooks, using the Syzygy hub provided by PIMS, and PreTeXt-based open textbooks, which can run Python code in-browser using embedded Sage cells.