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Student application of integration when considering P-V diagrams[1] JOHN THOMPSON, BRANDON BUCY, EVAN POLLOCK, DONALD MOUNTCASTLE, University of Maine — As part of work on teaching and learning in upper-level undergraduate thermodynamics courses, we are exploring student connections between the physics and the underlying mathematics, which is required for productive reasoning about thermal and statistical physics. Previous results on the teaching and learning of the First Law of Thermodynamics document indiscriminate application of the concept of *state function*, e.g., both to internal energy and to work. We have developed questions devoid of physical context that probe student understanding of the relevant principal math concepts in a manner completely analogous to the physics questions used by previous researchers. We have administered these questions in upper-level undergraduate thermodynamics courses. Comparison of student performance on these analogous physics and math questions shows a distinction between conceptual physics difficulties and difficulties with application of the underlying mathematics. Data will be presented from physics, chemistry and engineering students.

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