MATH 202: VECTOR CALCULUS
READING QUESTIONS FOR MONDAY WEEK 10

Reading assignment. *CAES* §9.3.

Problem 1. Let $\Phi : D \to A$ be a k-surface in an open set $A \subseteq \mathbb{R}^n$. The *cotangent bundle* of Φ is a mapping $c : T^*\Phi \to \Phi(D)$ for which $c^{-1}\{a\}$ is the dual vector space of the tangent space to Φ at $a \in \Phi(D)$. (This falls short of a definition because it fails to tell you how the *fibers* $T^*_a\Phi := c^{-1}\{a\}$ are glued together into a single space $T^*\Phi$. For the purposes of this exercise, imagine that there is a reasonable way to do so.) Explain why a smooth mapping $s : \Phi(D) \to T^*\Phi$ such that $s(a) \in T^*_a\Phi$ (called a *section of the cotangent bundle*) ought to be the same thing as a 1-form on Φ.