Determination of convex bodies by derivatives of section functions

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It is known that non-symmetric convex bodies generally cannot be characterized by the volumes of hyperplane sections through one interior point. Falconer and Gardner, however, independently proved that volumes of hyperplane sections through two different interior points determine the body uniquely. We prove that if $-1 < q < n-1$ is not an integer, then the derivatives of the order q at zero of parallel section functions at one interior point completely characterize convex bodies in R^n. If $0 \leq q < n-1$ is an integer, then one needs the derivatives of order q at two different interior points (except for the case where $q = n-2$, q odd), generalizing the result of Falconer and Gardner. We also prove that the volumes of hyperplane sections through one boundary point determine the body uniquely. This is joint work with Chris Shane.