Let R be a commutative ring with 1. If F is a free module of rank $n < \infty$, then show that $Hom_R(F, M)$ is isomorphic to M^n, for each R-module M.

I was thinking about defining a map
$\Psi : Hom_R(F, M) \to M^n$ by $\Psi(f) = (f(e_1), f(e_2), \ldots, f(e_n))$ where F is free on $(e_1, \ldots, e_n)$ and show Ψ is an isomorphism. But I am having difficulties showing it is onto.