Jacobian Question

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Example Question

Suppose that we have a parameter vector $\theta = (\theta_1, \ldots, \theta_k) \in \mathbb{R}^k$ and $\theta \sim F$ for some distribution F. We also have a function $h : \mathbb{R}^k \to \Delta^m$ where $\Delta^m = \{(t_1, \ldots, t_m) \in \mathbb{R}^m : \sum_i t_i = 1 \text{ and } t_i > 0 \text{ for all } i\}$ is the m dimensional simplex. Let $\phi = (\phi_1, \ldots, \phi_m) = h(\theta)$. Then, suppose that we have an iid multinomial sample $X = (X_1, \ldots, X_n)$ with $X_i \sim \text{Multinomial}(\phi)$ for $i = 1, \ldots, n$.

The Bayesian posterior density $p(\theta \mid X)$ is our target density. We want to estimate this density using importance sampling. We generate B realizations $\theta^* \sim G$ with $\theta^* \in \mathbb{R}^k$. How do we calculate the correct importance weights?