1. Let $X = k^n$, where $k$ is an algebraically closed field of characteristic zero. Show that for any $m \in \mathbb{Z}$ such that $n \leq m \leq 2n$ there exists a finitely generated $D_X$-module $M$ such that $d(M) = m$.

2. Let $\alpha \notin \mathbb{Z}$. Let $D = D(1)$. Let $M$ be the quotient of $D$ by the left ideal generated by $(z\partial - \alpha)^2$. Let $N$ be the quotient of $D$ by the left ideal generated by $z\partial - \alpha$.
   Show that:
   (a) $M$ is a holonomic $D$-module and its Bernstein multiplicity is equal to 2;
   (b) $N$ is a holonomic $D$-module and its Bernstein multiplicity is equal to 1;
   (c) we have an exact sequence
   $$0 \rightarrow N \rightarrow M \rightarrow N \rightarrow 0$$
   but $M$ is not isomorphic to a direct sum $N \oplus N$;
   (d) the characteristic varieties of $M$ and $N$ are equal.

3. Let $X = k^n$ and $Y = X \times k = k^{n+1}$. Let $i$ be the inclusion $i(x) = (x, 0)$. Let $M$ be a finitely generated $D_X$-module with characteristic variety $Ch(M) \subset k^n \times k^n$. Prove that
   $$Ch(i_+(M)) = \{(x, 0, y, \beta) \mid (x, y) \in Ch(M) \text{ and } \beta \in k\} \subset k^{n+1} \times k^{n+1}.$$