by Poor. P244, 8.2 Proposition), $B-B'$ is similar to

$$\begin{pmatrix} \begin{matrix} 0 & 1 \\ -1 & 0 \end{matrix} & 0 & & 0 \\ 0 & \begin{matrix} 0 & 1 \\ -1 & 0 \end{matrix} & & \\ & & \ddots \begin{matrix} 0 & 1 \\ -1 & 0 \end{matrix} & \\ 0 & & & 0 \end{pmatrix}. \Rightarrow \text{rank}(B-B') \text{ is even.}$$

To prove the note, which implies P_0 is in one of the two families by Proposition. 2 on P735, we will show the following lemma.

Lemma: Let Λ_B be the vector space generated by row vectors of $n \times 2n$ matrix (I, B), B $n\times n$ matrix. Similarly, $\Lambda_{B'}$ is the v.s generated by row vectors of $n \times 2n$ matrix (I, B') B' $n\times n$. Then $\dim(\Lambda_B \cap \Lambda_{B'}) = n - \text{rank}(B-B')$.

proof). Let $e_i = (\overline{0 \cdots 0}\ \overset{i}{1}\ \overline{0 \cdots 0})$, $(b_{i1}, \cdots b_{in}) = B_i$ and $B_i' = (b_{i1}', \cdots b_{in}')$ be row vectors of I, B, B' respectively. Let $\tilde{e}_i = (\overline{0 \cdots \overset{i}{1} \cdots 0}\ \overline{0 \cdots \overset{n}{} \cdots 0})$, $\tilde{B}_i = (0 \cdots 0, b_{i1} \cdots)$ $\tilde{B}_i' = (0 \cdots 0\ b_{i1}' \cdots b_{in}')$, and $\tilde{e}_i + \tilde{B}_i = v_i$ $\quad \tilde{e}_i + \tilde{B}_i' = w_i$.
Then since v_i's are linearly independent and w_i's are linearly independent, for any vector $u \in \Lambda_B \cap \Lambda_{B'}$,
$u = x_i v_i = x_i w_i$. ($\because$ Each v_i can take care of only w_i).
$\Rightarrow \sum_{i=1}^{n} x_i (v_i - w_i) = 0 \Rightarrow \{(x_i) \mid \sum x_i (v_i - w_i) = 0\} = K$ has the dimension $n - \text{rank}\begin{pmatrix} v_1 - w_1 \\ v_2 - w_2 \\ \vdots \end{pmatrix}$, where