We wish to have the infimum of (2.2.7) subject to the condition
\[ q_i > 0, \quad \sum_{i=1}^{\infty} q_i = 1. \] This implies that it is required to find out
the maximum of \( \sum_{i=1}^{\infty} p_i q_i^{(R-1)/R} \) subject to the condition \( q_i > 0, \)
\[ \sum_{i=1}^{\infty} q_i = 1 \] for all \( R(>0) \neq 1. \) To achieve this, by Lagrange's
multiplier technique, we have
\[
\phi = \frac{R}{R-1} \sum_{i=1}^{\infty} p_i q_i^{(R-1)/R} - \lambda \left( \sum_{i=1}^{\infty} q_i - 1 \right), \quad (R > 0, \neq 1)
\]
where \( \lambda \) is the Lagrange's multiplier. Now
\[
\frac{\delta \phi}{\delta q_i} = \frac{-1/R}{p_i q_i} - \lambda = 0 \quad (i = 1, \ldots, m).
\]
This gives
\[
p_i^R = q_i^R \lambda, \quad (R > 0, \neq 1).
\]
Adding \( (A_1) \) through \( 1 \) to \( m \) we get
\[
\sum_{i=1}^{\infty} p_i^R = \lambda^R, \quad (R > 0, \neq 1).
\]
Setting \( (A_2) \) in \( (A_1) \) we arrive at
\[ p_i^R = q_i \left( \sum_{i=1}^{m} p_i^R \right) \]

or
\[ p_i q_i = \left( \sum_{i=1}^{m} p_i^R \right)^{1/R} \]

or
\[ p_i q_i = q_i \left( \sum_{i=1}^{m} p_i^R \right)^{1/R}, \quad (R > 0; j \neq 1). \]

Now summing i to m, obtain
\[ \sum_{i=1}^{m} p_i q_i^{(R-1)/R} = \left( \sum_{i=1}^{m} p_i^R \right)^{1/R}, \quad (R > 0; j \neq 1). \] ...(A3)

Finally, put (A3) in (2.2.7) to get the expression as described in (1.2.22).