Syntax

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real vector invorder(real vector p)
real vector revorder(real vector p)
```

where \( p \) is assumed to be a permutation vector.

Description

\texttt{invorder}(p) \ returns \ the \ permutation \ vector \ that \ undoes \ the \ permutation \ performed \ by \ \texttt{p}.

\texttt{revorder}(p) \ returns \ the \ permutation \ vector \ that \ is \ the \ reverse \ of \ the \ permutation \ performed \ by \ \texttt{p}.

Remarks and examples

See [M-1] \texttt{permutation} \ for \ a \ description \ of \ permutation \ vectors. \ To \ summarize,

1. Permutation vectors \( p \) \ are \ used \ to \ permute \ the \ rows \ or \ columns \ of \ a \ matrix \ \( X: r \times c \).

   If \( p \) \ is \ intended \ to \ permute \ the \ rows \ of \ \( X \), \ the \ permuted \ \( X \) \ is \ obtained \ via \ \( Y = X[p, .] \).

   If \( p \) \ is \ intended \ to \ permute \ the \ columns \ of \ \( X \), \ the \ permuted \ \( X \) \ is \ obtained \ via \ \( Y = X[., p] \).

2. If \( p \) \ is \ intended \ to \ permute \ the \ rows \ of \ \( X \), \ it \ is \ called \ a \ row-permutation \ vector. \ Row-permutation \ vectors \ are \ \( r \times 1 \) \ column \ vectors.

3. If \( p \) \ is \ intended \ to \ permute \ the \ columns \ of \ \( X \), \ it \ is \ called \ a \ column-permutation \ vector. \ Column-permutation \ vectors \ are \ \( 1 \times c \) \ row \ vectors.

4. Row-permutation vectors contain a permutation of the integers 1 to \( r \).

5. Column-permutation vectors contain a permutation of the integers 1 to \( c \).

Let us assume that \( p \) \ is \ a \ row-permutation \ vector, \ so \ that

\[ Y = X[p, .] \]

\texttt{invorder}(p) \ returns \ the \ row-permutation \ vector \ that \ undoes \ \texttt{p}:

\[ X = Y[\text{invorder}(p), .] \]
That is, using the matrix notation of \([\text{M-1}]\) permutation,

\[ Y = PX \quad \text{implies} \quad X = P^{-1}Y \]

If \(p\) is the permutation vector corresponding to permutation matrix \(P\), \texttt{invorder}(p)\) is the permutation vector corresponding to permutation matrix \(P^{-1}\).

\texttt{revorder}(p)\) returns the permutation vector that reverses the order of \(p\). For instance, say that row-permutation vector \(p\) permutes the rows of \(X\) so that the diagonal elements are in ascending order. Then \texttt{revorder}(p)\) would permute the rows of \(X\) so that the diagonal elements would be in descending order.

**Conformability**

\texttt{invorder}(p), \texttt{revorder}(p):

\[
\begin{align*}
p: & \quad r \times 1 \quad \text{or} \quad 1 \times c \\
\text{result}: & \quad r \times 1 \quad \text{or} \quad 1 \times c
\end{align*}
\]

**Diagnostics**

\texttt{invorder}(p)\) and \texttt{revorder}(p)\) can abort with error or can produce meaningless results when \(p\) is not a permutation vector.

**Also see**

\([\text{M-1}]\) \texttt{permutation} — An aside on permutation matrices and vectors

\([\text{M-4}]\) \texttt{manipulation} — Matrix manipulation