# numrec

miscellaneous "numerical" routines

## contents



### 1.1 Outline

This file contains various miscellaneous "numerical" routines as described below.

### 1.2 `gi00ab`

1. This routine assigns the Fourier mode labels that converts a double-sum into a single sum; i.e., the $m_j$ and $n_j$ are assigned where

$$f(\theta,\zeta) = \sum_{n=0}^{N} f_{0,n}\cos(-n\,N_P\,\zeta) + \sum_{m=1}^{M}\sum_{n=-N}^{N} f_{m,n}\cos(m\theta - n\,N_P\,\zeta) \tag{1}$$

$$= \sum_{j} f_j\cos(m_j\theta - n_j\zeta), \tag{2}$$

where $N \equiv$ `Ntor` and $M \equiv$ `Mpol` are given on input, and $N_P \equiv$ `Nfp` is the field periodicity.

### 1.3 `tfft`

1. This constructs the "forward" Fourier transform.
2. Given a set of data, $(f_i, g_i)$ for $i = 1, \ldots N_\theta N_\zeta$, on a regular two-dimensional angle grid, where $\theta_j = 2\pi j/N_\theta$ for $j = 0, N_\theta - 1$, and $\zeta_k = 2\pi k/N_\zeta$ for $k = 0, N_\zeta - 1$. The "packing" is governed by $i = 1 + j + kN_\theta$. The "discrete" resolution is $N_\theta \equiv$ `Nt`, $N_\zeta \equiv$ `Nz` and `Ntz` $=$ `Nt` $\times$ `Nz`, which are set in preset.
3. The Fourier harmonics consistent with Eqn.(2) are constructed. The mode identification labels appearing in Eqn.(2) are $m_j \equiv$ `im(j)` and $n_j \equiv$ `in(j)`, which are set in global via a call to `gi00ab`.

### 1.4 `invfft`

1. Given the Fourier harmonics, the data on a regular angular grid are constructed.
2. This is the inverse routine to `tfft`.

### 1.5 `gauleg`

1. Compute Gaussian integration weights and abscissae.
2. From Numerical Recipes.