

# NEWS for pracma version 0.7.5

October 14, 2011

---

NEWS

*pracma News*

---

## **Changes in Version 0.7.5 (2011-07-26)**

- Put NEWS.Rd in the /inst subdirectory (and NEWS.pdf in /doc), thanks to Kurt Hornik; slightly changed the version numbering.

## **Changes in Version 0.7.4 (2011-07-22)**

- rortho() generate random orthogonal matrix of size n.
- Titanium data set for testing fitting procedures.

## **Changes in Version 0.7.3 (2011-07-15)**

- erf() and erfc() error and complementary error functions (Matlab style) as (almost) aliases for pnorm().
- erfz() complex error function.

## **Changes in Version 0.7.2 (2011-07-11)**

- broyden() quasi-Newton root finding method for systems of nonlinear equations.

## **Changes in Version 0.7.1 (2011-07-09)**

- cross() has been vectorized (remark on R-help).

## **Changes in Version 0.7.0 (2011-07-07)**

- Sigmoid and Einstein functions.
- Updated NEWS.Rd, NEWS.pdf

## **Changes in Version 0.6.9 (2011-07-06)**

- Runge-Kutta-Fehlberg method of order (5,4).

**Changes in Version 0.6.8 (2011-07-05)**

- triquad() Gaussian quadrature over triangles.
- cotes() Newton-Cotes integration formulae for 2 to 8 nodes.

**Changes in Version 0.6.7 (2011-07-04)**

- lagrangeInterp(), newtonInterp() Lagrange and Newton polynomial interpolation, neville() Neville's methods.
- tril(), triu() extracting triangular matrices (Matlab style).

**Changes in Version 0.6.6 (2011-07-02)**

- charpoly() computes the characteristic polynomial, the determinant, and the inverse for matrices that are relatively small, applying the Faddejew-Leverrier method.
- froots() to find \*all\* roots (also of second or higher order) of a univariate function in a given interval. The same with fmins() to find all minima.

**Changes in Version 0.6.5 (2011-07-01)**

- Adams-Bashford and Adams-Moulton (i.e., multi-step) methods for ordinary differential equations in function abm3pc().

**Changes in Version 0.6.4 (2011-06-30)**

- Changed the description to be more precise about the package.
- droplet\_e() generation of digits for the Euler number. (Should be followed by a function droplet\_pi().)

**Changes in Version 0.6.3 (2011-06-28)**

- rationalfit() rational function approximation
- ratinterp() rational interpolation a la Burlisch-Stoer.

**Changes in Version 0.6.2 (2011-06-26)**

- pade() Pade approximation.

**Changes in Version 0.6.1 (2011-06-25)**

- quadgk() adaptive Gauss-Kronrod quadrature.

**Changes in Version 0.6.0 (2011-06-24)**

- muller() Muller's root finding method.
- Added differential equation example to expm()'s help page.
- Changed NEWS file to become simpler (no subsections); updated the NEWS.Rd, NEWS.pdf files.

**Changes in Version 0.5.9 (2011-06-23)**

- `quadl()` recursive adaptive Gauss-Lobatto quadrature.
- `simpadpt()` another recursively adaptive Simpson's rule.
- Added testing procedures for all integration routines; corrected, refined some of these procedures.

**Changes in Version 0.5.8 (2011-06-20)**

- `quadgr()` Gaussian Quadrature with Richardson extrapolation, can handle singularities at endpoints and (half-)infinite intervals.

**Changes in Version 0.5.7 (2011-06-18)**

- `expm()` for matrix exponentials.
- `clenshaw_curtis()` the Clenshaw-Curtis quadrature formula.

**Changes in Version 0.5.6 (2011-06-17)**

- `simpson2d()` as non-adaptive 2-dimensional Simpson integration.
- `dblquad()` twofold application of internal function `integrate()`.

**Changes in Version 0.5.5 (2011-06-15)**

- `gaussHermite()` and `gaussLaguerre()` for infinite intervals.
- Fresnel integrals `fresnelS()` and `fresnelC()`.

**Changes in Version 0.5.4 (2011-06-12)**

- `gaussLegendre()` computes coefficients for Gauss Quadrature, and `quad2d()` uses these weights for 2-dimensional integration.
- `quadinf()` wrapper for `integrate()` on infinite intervals.
- Added a version for rapid pi computation to the `agm()` examples.

**Changes in Version 0.5.3 (2011-06-06)**

- `ode23()` solving first order (systems of) differential equations.
- `barylag2d()` 2-dimensional barycentric Lagrange interpolation.

**Changes in Version 0.5.2 (2011-06-04)**

- `interp2()` for two-dimensional interpolation.
- `gradient()` now works in two dimensions too.

**Changes in Version 0.5.1 (2011-06-01)**

- `fzero()`, `fminbnd()`, `fminsearch()`, `fsolve()` as aliases for `uniroot()`, `optimize()`, `optim()` with Nelder-Mead, `newtonsys()`.

**Changes in Version 0.5.0 (2011-05-31)**

- Corrections to help pages.

**Changes in Version 0.4.9 (2011-05-30)**

- romberg() and gauss\_kronrod() for numerical integration.
- Richardson's extrapolation in numderiv(), numdiff().
- Discrete numerical derivatives (one dimension): gradient().

**Changes in Version 0.4.8 (2011-05-28)**

- Numerical function derivatives: fderiv(), grad().
- Specialized operators: hessian(), laplacian().
- Application: taylor().

**Changes in Version 0.4.7 (2011-05-27)**

- plot vector fields: quiver() and vectorfield().
- findintervals().
- Corrections in deval(), deeve(), using findintervals().

**Changes in Version 0.4.6 (2011-05-26)**

- Laguerre's method laguerre().
- rk4() and rk4sys() classical fourth order Runge-Kutta.
- deval(), deeve() evaluate ODE solutions.

**Changes in Version 0.4.5 (2011-05-24)**

- Lebesgue coefficient: lebesgue().
- poly2str() for string representation of a polynomial.

**Changes in Version 0.4.4 (2011-05-23)**

- Dirichlet's eta() and Riemann's zeta() function.
- rmserr() different accuracy measures; std\_err() standard error.

**Changes in Version 0.4.3 (2011-05-22)**

- polypow() and polytrans() for polynomials.
- polyApprox() polynomial approximation using Chebyshev.
- trigPoly(), trigApprox() for trigonometric regression.

**Changes in Version 0.4.2 (2011-05-17)**

- segm\_intersect() and segm\_distance() segment distances.
- inpolygon().

**Changes in Version 0.4.1 (2011-05-13)**

- polyadd() polynomial addition.
- conv() and deconv() time series (de)convolution.
- detrend() removes (piecewise) linear trends.
- ifft() for normalized inverse Fast Fourier Transform.

**Changes in Version 0.4.0 (2011-05-10)**

- Added tests for functions since version 0.3-7.

**Changes in Version 0.3.9 (2011-05-09)**

- `and()` and `or()`.

**Changes in Version 0.3.8 (2011-05-06)**

- `pchip()` and option 'cubic' for `interp1()` interpolation.
- The complex gamma functions `gammaz()`.
- `hadamard()` and `toeplitz()` matrices.

**Changes in Version 0.3.7 (2011-05-04)**

- Rank of a matrix, `mrnk()`, and `nullspace()` for the kernel.
- `orth()`, orthogonal basis of the image space, and `subspace()` determines the angle between two subspaces.
- `normest()` for estimating the (Frobenius) norm of a matrix, and `cond()` determines the condition number of a matrix.

**Changes in Version 0.3.6 (2011-04-30)**

- `fact()`, more accurate than the R internal function 'factorial'.
- `ezplot()` as an alias for `curve()`, but with option "fill = TRUE".
- `aitken()` for accelerating iterations.
- Renamed `polycnv()` to `polymul()`.
- Renamed `outlierMAD()` to `hampel()`.

**Changes in Version 0.3.5 (2011-04-23)**

- `agm()` for the arithmetic-geometric mean.
- Lambert W function `lambertWp()` for the real principal branch.
- "Complex Step" derivation with `complexstep()` and `complexstepJ()`.

**Changes in Version 0.3.4 (2011-04-21)**

- Barycentric Lagrange interpolation through `barylag()`.
- `polyfit2()` fits a polynomial that exactly meets one additional point.
- Added more references to the help entry 'prasma-package.Rd'.

**Changes in Version 0.3.3 (2011-04-19)**

- `hornerdefl()` for also returning the deflated polynomial.
- `newtonHorner()` combining Newton's method and the Horner scheme for root finding for polynomials.
- `jacobian()` computes the Jacobian of a function  $R^n \rightarrow R^m$  as simple numerical derivative.
- `newtonsys()` applies Newton's method to functions  $R^n \rightarrow R^n$  with special application to root finding of complex functions.
- `newton()` renamed to `newtonRaphson()`.

**Changes in Version 0.3.2 (2011-04-17)**

- Sorting functions: bubbleSort(), insertionSort(), selectionSort(), shellSort(), heapSort(), mergeSort(), mergeOrdered(), quickSort(), quickSortx(), is.sorted(), and testSort().
- Functions from number theory: eulersPhi(), moebiusFun() and the mertensFun(), sigma(), tau(), omega(), and Omega().

**Changes in Version 0.3.1 (2011-04-16)**

- Chebyshev polynomials of the first kind: chebPoly(), chebCoeff(), and chebApprox().

**Changes in Version 0.3.0 (2011-04-09)**

- New version of news.Rd, news.pdf.
- More test functions for root finding and quadrature.

**Changes in Version 0.2.9**

- fnorm() and the Runge function runge().
- contfrac(), rat(), and rats() for continuous fractions.
- meshgrid() and magic().

**Changes in Version 0.2.8**

- quad() adaptive Simpson quadrature.
- Minimum finding with fibsearch() and golden\_ratio().
- Root finding with newton(), secant(), and brentDekker().

**Changes in Version 0.2.7**

- Regular expression functions regexp(), regexpi(), regexprep() and refindall().

**Changes in Version 0.2.6**

- String functions blanks(), strtrim(), deblank(), strjust(), and strep().
- interp1() one-dimensional interpolation (incl. spline)

**Changes in Version 0.2.5**

- Matlab functions mode(), clear() and beep().

**Changes in Version 0.2.4**

- primroot() finds the smallest primitive root modulo a given n; needed functions are mod-power() and modorder().
- humps() and sinc(): Matlab test functions.
- Root finding through bisection: bisect(), regulaFalsi().
- outlierMAD(), findpeaks(), and piecewise().
- polycnv() for polynomial multiplication.
- Functions extgcd(), gcd(), and lcm() have been renamed to extGCD(), GCD(), and LCM() respectively.

**Changes in Version 0.2.3**

- `strfind()`, `strfindi()`, and `findstr()`.
- `circlefit()` fitting a circle to plane points.
- `mldivide()` and `mrdivide()`, emulating the Matlab backslash operator.

**Changes in Version 0.2.2**

- `vnorm()` vector norm
- Warning about a nasty “non-ASCII input” in the `savgol.RD` file has been resolved.

**Changes in Version 0.2.1**

- `horner()` implementing the horner scheme for evaluating a polynomial and its derivative.
- `savgol()` Savitzki-Golay smoothing and needed pseudoinverse `pinv()`.

**Changes in Version 0.2.0**

- Package renamed to ‘`pracma`’ to avoid name clashes with packages such as ‘`matlab`’ that are sticking closer to the original.
- Added ‘`pracma-package`’ section to the manual.

**Changes in Version 0.1.9**

- `reshape()`, `repmat()`, and `blkdiag()` matrix functions.
- `combs()` chooses all combinations of `k` elements out of `n`, and `randcomb()` generates a random selection.
- `perms()` generates all permutations, `randperm()` a random permutation.
- Pascal triangle as `pascal()`; `nchoosek()` returns binomial coefficients.
- Some string functions: `strcmp()`, `strcmpi()`, `strcat()`.

**Changes in Version 0.1.8**

- `std()` as refinement of the standard deviation function.
- `ceil()` and `fix()` as aliases for `ceiling()` and `trunc()`. [`floor()` and `round()` already exist in R.]
- Modulo functions `mod()`, `rem()` and integer division `idiv()`.
- Integer functions related to the Euclidean algorithm: `extgcd()`, `gcd()`, `lcm()`, `coprime()`, and `modinv()`.
- `distmat()` and `crossn()`, the vector product in `n`-dimensional space.

**Changes in Version 0.1.7**

- `size()`, `numel()`, `ndims()`, `isempty()`, and `find()`.
  - `eye()`, `ones()`, `zeros()`.
  - Functions returning random numbers: `rand()`, `randn()`, `randi()`.
  - `linspace()`, `logspace()`, and `logseq()` for linearly, logarithmically, and exponentially spaced sequences.
- Note that the functions in the ‘`matlab`’ package are not exactly mimicking the corresponding Matlab/Octave functions.

**Changes in Version 0.1.6**

- Matrix functions `mdiag()` and `mtrace()` added. `inv()` is introduced as an alias for `solve()` in R.
- Generate special matrices `hankel()`, `rosser()`, and `wilkinson()`. `kron()` is an alias for the R function `kronecker()`.
- Renamed `factors()` to `ifactor()` to distinguish it more clearly from `factors` as used in R.

**Changes in Version 0.1.5**

- Added functions for flipping or rotating numeric and complex matrices: `flipdim()`, `flipud()`, `fliplr()`, and `rot90()`.

**Changes in Version 0.1.4**

- Added basic complex functions `real()`, `imag()`, `conj()`, and `angle()` which are essentially only aliases of the R functions `Re()`, `Im()`, and `Conj()`.  
`angle()` returns the angle of a complex number in radians. The R function `Mod()` is here only available as `abs()`.

**Changes in Version 0.1.3**

- Added `compan()` function for the ‘companion’ matrix; the `eig()` function is an alias for the R `eigen()` values function.
- Added the polynomial functions `poly()`, `polyder()`, `polyfit()`, `polyint()`, and `polyval()`.
- `roots()` returns real and complex roots of polynomials.
- Simplified the `trapz()` function.

**Changes in Version 0.1.2**

- Added functions from number theory: `primes()`, `isprime()` and `factors()`.
- The corresponding function for `factors()` in Matlab/Octave is called `factor()`, but that name should not be shadowed in R!
- Added the `polyarea()` and `trapz()` functions.

**Changes in Version 0.1.1**

- Added some simple functions such as `nthroot()`, `pow2()`, and `nextpow2()`.
- `dot()` and `cross()` functions for scalar and vector product.
- Generate matrices through `vander()` and `hilb()`.

**Changes in Version 0.1.0**

- Installation  
‘`pracma`’ will be a pure R package without using source code in C or Fortran. Therefore, installation will be immediate on all platforms.
- Intention  
This package provides R implementations of more advanced math functions from Matlab and Octave (and the Euler Math Toolbox) with a special view on optimization and time series routines.
- Remark: Typeset this document as:  
`R CMD Rd2pdf NEWS.Rd --title="NEWS for pracma version 0.7.5".`



# Index

NEWS, [1](#)