

# Need A Hint?

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Suppose you have created an object in R, for example from a regression fit using `lm` or `loess`. You know that auxiliary functions exist that do useful computations on the object, but you can't remember their names. You need a hint on what to do next.

The `hints` function in the `hints` package does just this, finding a list of appropriate functions to jog your memory. For example, Figure 1 shows a list of hints for a `lm` object.

The output lists methods for generic functions like `print` specific to the class you specify, as well as searching the documentation to find all mentions of the class. You can then use the usual help mechanism to learn more about each of these methods and functions.

The `hints` function has three arguments:

```
hints(x, class = class(x), all.packages=FALSE)
```

If specified, the argument `x` can be any R object. For example, `x` might have been created by `x <- lm(y ~ z)`. `hints` determines the S3 class of the object, and then looks for functions that operate on that class. The S3 class of an object is a character vector, and may consist of multiple strings, as, for example, a generalized linear model which has `class c("glm", "lm")`. If `x` is not given, then you can specify the `class` you want hints about as character vector.

The `hints` function will look for methods and functions in all currently loaded packages. For example, the hints for `lm` would be different if either the `car` or the `alr3` packages have been loaded, since both of these add methods and functions for `lm` objects. Similarly, `hints(class="lda")` would return methods only if the package `MASS` were loaded, since all the relevant methods and functions are in that package. You can get hints for all your packages by

setting `all.packages=TRUE`, but note that this works by requiring all available packages so may be time consuming.

The `hints` package also includes an `xtable` method so, for example, `xtable(hints(m1))` would have produced a version of Figure 1, but in  $\text{\LaTeX}$  format.

The function isn't foolproof, as it depends on the quality of documentation written by others. It may find irrelevant functions if the name of the class appears in the documentation for the irrelevant function. It can miss functions, too. For example, the function `coefstest` in the `lmtest` package can be used with `lm` objects by applying the function `coefstest.default`. `Hints` can't figure this out because there is no explicit mention of `lm` in the function or the documentation, and so it misses the function. If the regression had been done using `glm` rather than `lm`, `hints` would have found `coefstest.glm`.

The explanations of what the methods and functions do may be more generic than one might want, if the title of the help page is too generic. In some cases, no explanation is found. For example, `simulate.lm` is shown in Figure 1, but its description is missing. The help page for `simulate` mentions the `lm` class, but no page is available for `simulate.lm`, and so the `hints` function doesn't know where to get documentation. Finally, the `hints` function can only find hints for S3 objects, not for S4. Nevertheless, this simple function can be a useful tool, if you are willing to take a hint.

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```

> hints(class = "lm")

Functions for lm in package 'base'
kappa                Estimate the Condition Number
base-defunct         Defunct Functions in Base Package
Functions for lm in package 'methods'
setOldClass          Specify Names for Old-Style Classes
Functions for lm in package 'stats'
add1                 Add or Drop All Possible Single Terms to a Model
alias                Find Aliases (Dependencies) in a Model
anova.lm             ANOVA for Linear Model Fits
case.names.lm        Case and Variable Names of Fitted Models
cooks.distance.lm    Regression Deletion Diagnostics
dfbeta.lm            Regression Deletion Diagnostics
dfbetas.lm           Regression Deletion Diagnostics
drop1.lm             Add or Drop All Possible Single Terms to a Model
dummy.coef.lm        Extract Coefficients in Original Coding
effects              Effects from Fitted Model
family.lm            Accessing Linear Model Fits
formula.lm           Accessing Linear Model Fits
hatvalues.lm         Regression Deletion Diagnostics
influence.lm         Regression Diagnostics
labels.lm            Accessing Linear Model Fits
logLik               Extract Log-Likelihood
model.frame.lm       Extracting the "Environment" of a Model Formula
model.matrix.lm      Construct Design Matrices
plot.lm              Plot Diagnostics for an lm Object
predict.lm           Predict method for Linear Model Fits
print.lm             Fitting Linear Models
proj                 Projections of Models
residuals.lm         Accessing Linear Model Fits
rstandard.lm         Regression Deletion Diagnostics
rstudent.lm          Regression Deletion Diagnostics
summary.lm           Summarizing Linear Model Fits
variable.names.lm    Case and Variable Names of Fitted Models
vcov                 Calculate Variance-Covariance Matrix for a Fitted Model
Object

case.names           Case and Variable Names of Fitted Models
dummy.coef           Extract Coefficients in Original Coding
influence.measures    Regression Deletion Diagnostics
lm                   Fitting Linear Models
lm.influence          Regression Diagnostics
lm.fit               Fitter Functions for Linear Models
model.frame           Extracting the "Environment" of a Model Formula
model.matrix          Construct Design Matrices
stats-defunct         Defunct Functions in Package stats
Functions for lm in package 'unknown'
confint.lm           NA
deviance.lm           NA
extractAIC.lm        NA
simulate.lm           NA

```

Figure 1: Hints for the lm class.