jumbled demonstrations

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03 April, 2024

Overview

This document demonstrates usage of some of the function in the jumbled repo, available from github.com/sashahafner/jumbled.

Load functions

```
ff <- list.files(pattern = '\\.R$')
for(i in ff) source(i)
```

aggregate2

A wrapper for `aggregate` that accepts multiple functions and simpler arguments. Does not accept formula notation.

Example from `aggregate` help file:

```
aggregate(breaks ~ wool + tension, data = warpbreaks, mean)
```

```
##   wool tension   breaks
## 1    A       L 44.55556
## 2    B       L 28.22222
## 3    A       M 24.00000
## 4    B       M 28.77778
## 5    A       H 24.55556
## 6    B       H 18.77778
```

To include sd and n, use `aggregate2`:

```
aggregate2(warpbreaks, x = 'breaks', by = c('wool', 'tension'),
           FUN = list(mean = mean, sd = sd, n = length))
```

```
##   wool tension breaks.mean breaks.sd breaks.n
## 1    A       L    44.55556 18.097729        9
## 2    B       L    28.22222  9.858724        9
## 3    A       M    24.00000  8.660254        9
## 4    B       M    28.77778  9.431036        9
## 5    A       H    24.55556 10.272671        9
## 6    B       H    18.77778  4.893306        9
```

Accepts multiple variables (as in `aggregate`).

```
aggregate2(na.omit(airquality), x = c('Ozone', 'Temp'), by = 'Month',
       FUN = list(mean = mean, sd = sd, n = length))
```

```
##   Month Ozone.mean Temp.mean Ozone.sd  Temp.sd Ozone.n Temp.n
## 1     5   24.12500  66.45833 22.88594 6.633113      24     24
## 2     6   29.44444  78.22222 18.20790 7.838651       9      9
## 3     7   59.11538  83.88462 31.63584 4.439161      26     26
## 4     8   60.00000  83.69565 41.76776 7.054559      23     23
## 5     9   31.44828  76.89655 24.14182 8.503549      29     29
```

aggregate3

Similar, but uses formula notation. Example from `aggregate` help file:

```
aggregate(breaks ~ wool + tension, data = warpbreaks, mean)
```

```
##   wool tension   breaks
## 1    A       L 44.55556
## 2    B       L 28.22222
## 3    A       M 24.00000
## 4    B       M 28.77778
## 5    A       H 24.55556
## 6    B       H 18.77778
```

To include sd and n, use `aggregate3`:

```
aggregate3(warpbreaks, breaks ~ wool + tension,
       FUN = list(mean = mean, sd = sd, n = length))
```

```
##   wool tension breaks.mean breaks.sd breaks.n
## 1    A       L    44.55556 18.097729        9
## 2    B       L    28.22222  9.858724        9
## 3    A       M    24.00000  8.660254        9
## 4    B       M    28.77778  9.431036        9
## 5    A       H    24.55556 10.272671        9
## 6    B       H    18.77778  4.893306        9
```

For multiple response variables, use `cbind()`.

```
aggregate3(airquality, cbind(Ozone, Temp) ~ Month,
       FUN = list(mean = mean, sd = sd, n = length))
```

```
##   Month Ozone.mean Temp.mean Ozone.sd  Temp.sd Ozone.n Temp.n
## 1     5   23.61538  66.73077 22.22445 6.533346      26     26
## 2     6   29.44444  78.22222 18.20790 7.838651       9      9
## 3     7   59.11538  83.88462 31.63584 4.439161      26     26
## 4     8   59.96154  83.96154 39.68121 6.666218      26     26
## 5     9   31.44828  76.89655 24.14182 8.503549      29     29
```

So `Ozone + Temp ~ Month` doesn't work, because `aggregate()` can't handle it propertly. It would be nice to address this limitation in the future.

dfcombos

Something like `expand.grid` for data frames. Can accept vectors too, but resulting name is poor.

```r
d1 <- data.frame(name = letters[1:5], x = 1.1)
d2 <- data.frame(b = 1:3)
dfcombos(d1, d2)
```

```
##    name   x b
## 1     a 1.1 1
## 2     b 1.1 1
## 3     c 1.1 1
## 4     d 1.1 1
## 5     e 1.1 1
## 6     a 1.1 2
## 7     b 1.1 2
## 8     c 1.1 2
## 9     d 1.1 2
## 10    e 1.1 2
## 11    a 1.1 3
## 12    b 1.1 3
## 13    c 1.1 3
## 14    d 1.1 3
## 15    e 1.1 3
```

```r
v1 <- c(TRUE, FALSE)
dfcombos(d1, d2, v1)
```

```
##    name   x b X[[i]]
## 1     a 1.1 1   TRUE
## 2     b 1.1 1   TRUE
## 3     c 1.1 1   TRUE
## 4     d 1.1 1   TRUE
## 5     e 1.1 1   TRUE
## 6     a 1.1 2   TRUE
## 7     b 1.1 2   TRUE
## 8     c 1.1 2   TRUE
## 9     d 1.1 2   TRUE
## 10    e 1.1 2   TRUE
## 11    a 1.1 3   TRUE
## 12    b 1.1 3   TRUE
## 13    c 1.1 3   TRUE
## 14    d 1.1 3   TRUE
## 15    e 1.1 3   TRUE
## 16    a 1.1 1  FALSE
## 17    b 1.1 1  FALSE
## 18    c 1.1 1  FALSE
## 19    d 1.1 1  FALSE
## 20    e 1.1 1  FALSE
## 21    a 1.1 2  FALSE
## 22    b 1.1 2  FALSE
## 23    c 1.1 2  FALSE
## 24    d 1.1 2  FALSE
## 25    e 1.1 2  FALSE
## 26    a 1.1 3  FALSE
## 27    b 1.1 3  FALSE
## 28    c 1.1 3  FALSE
## 29    d 1.1 3  FALSE
## 30    e 1.1 3  FALSE
```

dfsumm

Generate a data frame summary more detailed and compact than `summary` output.

```
dfsumm(attenu)
```

```
##
##  182 rows and 6 columns
##  182 unique rows
##                        event     mag station    dist   accel           date.time
## Class                numeric numeric  factor numeric numeric     POSIXct, POSIXt
## Minimum                    1       5    1008     0.5   0.003 2024-04-03 10:55:45
## Maximum                   23     7.7    c266     370    0.81 2024-04-03 10:55:45
## Mean                    14.7    6.08     262    45.6   0.154 2024-04-03 10:55:45
## Unique (excld. NA)        23      17     117     153     120                   1
## Missing values             0       0      16       0       0                   0
## Sorted                  TRUE   FALSE   FALSE   FALSE   FALSE                TRUE
##
```

Add date to check R v4.3 problem.

```
attenu$date.time <- Sys.time()
```

```
dfsumm(attenu)
```

```
##
##  182 rows and 6 columns
##  182 unique rows
##                        event     mag station    dist   accel           date.time
## Class                numeric numeric  factor numeric numeric     POSIXct, POSIXt
## Minimum                    1       5    1008     0.5   0.003 2024-04-03 10:57:55
## Maximum                   23     7.7    c266     370    0.81 2024-04-03 10:57:55
## Mean                    14.7    6.08     262    45.6   0.154 2024-04-03 10:57:55
## Unique (excld. NA)        23      17     117     153     120                   1
## Missing values             0       0      16       0       0                   0
## Sorted                  TRUE   FALSE   FALSE   FALSE   FALSE                TRUE
##
```

Compare to `summary`.

```
summary(attenu)
```

```
##      event            mag           station          dist
##  Min.   : 1.00   Min.   :5.000   117    :  5   Min.   :  0.50
##  1st Qu.: 9.00   1st Qu.:5.300   1028   :  4   1st Qu.: 11.32
##  Median :18.00   Median :6.100   113    :  4   Median : 23.40
##  Mean   :14.74   Mean   :6.084   112    :  3   Mean   : 45.60
##  3rd Qu.:20.00   3rd Qu.:6.600   135    :  3   3rd Qu.: 47.55
##  Max.   :23.00   Max.   :7.700   (Other):147   Max.   :370.00
##                                  NA's   : 16
##      accel            date.time
##  Min.   :0.00300   Min.   :2024-04-03 10:57:55.69
##  1st Qu.:0.04425   1st Qu.:2024-04-03 10:57:55.69
##  Median :0.11300   Median :2024-04-03 10:57:55.69
##  Mean   :0.15422   Mean   :2024-04-03 10:57:55.69
##  3rd Qu.:0.21925   3rd Qu.:2024-04-03 10:57:55.69
##  Max.   :0.81000   Max.   :2024-04-03 10:57:55.69
##
```

interpm

Fill in missing observations for multiple columns via interpolation. `interpm` calls `approx`.

```
args(interpm)
```

```
## function (dat, x, ys, by = NA, ...)
## NULL
```

```
dat <- data.frame(time = 1:30, a = rnorm(30), b = rnorm(30), c = rnorm(30))
dat[5:10, -1] <- NA
dat[20:22, 'a'] <- NA

dat
```

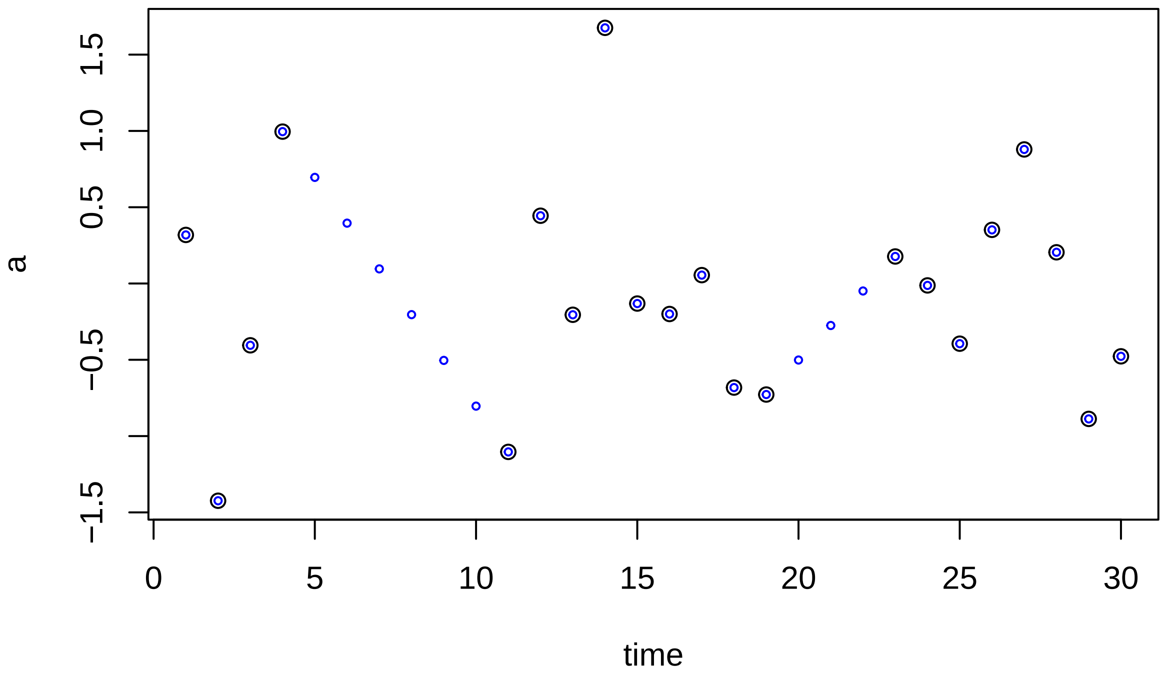
```
##    time           a           b           c
## 1     1  0.31833673 -0.26774095 -0.46288318
## 2     2 -1.42379885  1.58585916 -0.88455498
## 3     3 -0.40509086  0.04690059 -1.63092757
## 4     4  0.99538657  0.35649678  0.56223059
## 5     5          NA          NA          NA
## 6     6          NA          NA          NA
## 7     7          NA          NA          NA
## 8     8          NA          NA          NA
## 9     9          NA          NA          NA
## 10   10          NA          NA          NA
## 11   11 -1.10363778 -0.46205239 -0.09514776
## 12   12  0.44418506 -0.22509928  1.13878050
## 13   13 -0.20495061 -0.84644780  0.50231463
## 14   14  1.67563243  0.07304632 -0.51541405
## 15   15 -0.13132225 -0.27503642 -2.46839047
## 16   16 -0.19988298 -0.38642636 -0.87255274
## 17   17  0.05491242 -0.04620314  0.96408808
## 18   18 -0.68216549 -0.82589372  0.91079625
## 19   19 -0.72770415 -0.85403424  1.92580884
## 20   20          NA  0.11873681 -0.30290695
## 21   21          NA  0.28359691 -1.05470705
## 22   22          NA  1.93008647  0.41811609
## 23   23  0.17716660 -1.14052762  0.70127282
## 24   24 -0.01250080 -1.32211824  0.24675828
## 25   25 -0.39431713  1.22883161  0.46429516
## 26   26  0.35156293 -0.54845603 -0.39546819
## 27   27  0.87876756 -0.12600749  0.71307031
## 28   28  0.20465408  0.68771872  1.18501256
## 29   29 -0.88738071  0.70520038 -1.91114929
## 30   30 -0.47721606  0.80147843  1.11493056
```

```
dat2 <- interpm(dat, 'time', c('a', 'b', 'c'))

dat2
```

```
##    time           a            b            c
## 1      1  0.31833673 -0.267740953 -0.46288318
## 2      2 -1.42379885  1.585859163 -0.88455498
## 3      3 -0.40509086  0.046900595 -1.63092757
## 4      4  0.99538657  0.356496777  0.56223059
## 5      5  0.69552594  0.239561182  0.46831939
## 6      6  0.39566532  0.122625586  0.37440820
## 7      7  0.09580470  0.005689991  0.28049701
## 8      8 -0.20405592 -0.111245605  0.18658582
## 9      9 -0.50391654 -0.228181200  0.09267462
## 10    10 -0.80377716 -0.345116796 -0.00123657
## 11    11 -1.10363778 -0.462052391 -0.09514776
## 12    12  0.44418506 -0.225099283  1.13878050
## 13    13 -0.20495061 -0.846447800  0.50231463
## 14    14  1.67563243  0.073046319 -0.51541405
## 15    15 -0.13132225 -0.275036420 -2.46839047
## 16    16 -0.19988298 -0.386426357 -0.87255274
## 17    17  0.05491242 -0.046203141  0.96408808
## 18    18 -0.68216549 -0.825893722  0.91079625
## 19    19 -0.72770415 -0.854034238  1.92580884
## 20    20 -0.50148646  0.118736809 -0.30290695
## 21    21 -0.27526878  0.283596906 -1.05470705
## 22    22 -0.04905109  1.930086466  0.41811609
## 23    23  0.17716660 -1.140527618  0.70127282
## 24    24 -0.01250080 -1.322118243  0.24675828
## 25    25 -0.39431713  1.228831605  0.46429516
## 26    26  0.35156293 -0.548456032 -0.39546819
## 27    27  0.87876756 -0.126007492  0.71307031
## 28    28  0.20465408  0.687718722  1.18501256
## 29    29 -0.88738071  0.705200376 -1.91114929
## 30    30 -0.47721606  0.801478429  1.11493056
```

```r
plot(a ~ time, data = dat)
points(a ~ time, data = dat2, cex = 0.5, col = 'blue')
```



Now woks for data.tables too.

```
dat <- data.table::as.data.table(dat)
dat2 <- interpm(dat, 'time', c('a', 'b', 'c'))
```

```
dat <- data.frame(time = rep(1:10, 3), group = rep(c('a', 'b', 'c'), each = 10), a = rnorm(30), b = rno
dat[5:9, -1:-2] <- NA
dat[c(20, 22), 'a'] <- NA

dat
```

```
##    time group           a          b           c
## 1     1     a -0.46930021  1.3491063 -0.49751241
## 2     2     a -1.14800275 -1.6350828  0.76558578
## 3     3     a  1.10399796 -0.7155327  0.50139307
## 4     4     a -0.28924992 -0.9164943  0.33191117
## 5     5     a          NA         NA          NA
## 6     6     a          NA         NA          NA
## 7     7     a          NA         NA          NA
## 8     8     a          NA         NA          NA
## 9     9     a          NA         NA          NA
## 10   10     a -0.12892591  0.4598761  0.62192056
## 11    1     b  0.29911231  0.1677058 -1.47180517
## 12    2     b  0.01829921 -0.2750030  0.79819546
## 13    3     b -1.15006133  0.4923226  0.27946251
## 14    4     b -0.42939635  1.3397546  0.65787426
## 15    5     b  0.85000298 -0.4767442  0.59372632
## 16    6     b -0.21482949 -1.4967955 -0.57792651
## 17    7     b -0.61741402 -1.2014240  0.47606273
## 18    8     b  0.10942738 -0.4074610 -1.18763362
## 19    9     b -0.70651106 -0.9477481  0.71768805
## 20   10     b          NA  0.8516664  0.13469724
## 21    1     c  0.35080172 -0.5884310  1.42208034
## 22    2     c          NA -1.3624731  0.04073091
## 23    3     c -0.03337353 -0.4496379 -0.33840975
## 24    4     c  0.36144400 -0.6433250 -0.55811539
## 25    5     c  1.04557564 -0.5107456  1.02781348
## 26    6     c  0.10321239  0.2572020 -0.22547048
## 27    7     c  0.33179556 -0.4195554 -1.23163005
## 28    8     c -1.56855881 -0.9522277 -0.75824474
## 29    9     c  0.44026994  0.5123934  1.08551815
## 30   10     c  1.88187132 -1.7442677 -1.04909888
```

```
interpm(dat, 'time', c('a', 'b', 'c'), by = 'group')
```

```
##    time group           a           b           c
## 1     1     a -0.46930021  1.34910627 -0.49751241
## 2     2     a -1.14800275 -1.63508277  0.76558578
## 3     3     a  1.10399796 -0.71553273  0.50139307
## 4     4     a -0.28924992 -0.91649432  0.33191117
## 5     5     a -0.26252925 -0.68709924  0.38024607
## 6     6     a -0.23580858 -0.45770417  0.42858097
## 7     7     a -0.20908791 -0.22830909  0.47691586
## 8     8     a -0.18236724  0.00108599  0.52525076
## 9     9     a -0.15564657  0.23048107  0.57358566
## 10   10     a -0.12892591  0.45987615  0.62192056
## 11     1     b  0.29911231  0.16770583 -1.47180517
## 12     2     b  0.01829921 -0.27500302  0.79819546
## 13     3     b -1.15006133  0.49232262  0.27946251
## 14     4     b -0.42939635  1.33975457  0.65787426
## 15     5     b  0.85000298 -0.47674422  0.59372632
## 16     6     b -0.21482949 -1.49679554 -0.57792651
## 17     7     b -0.61741402 -1.20142397  0.47606273
## 18     8     b  0.10942738 -0.40746103 -1.18763362
## 19     9     b -0.70651106 -0.94774810  0.71768805
## 20    10     b          NA  0.85166640  0.13469724
## 21     1     c  0.35080172 -0.58843101  1.42208034
## 22     2     c  0.15871409 -1.36247310  0.04073091
## 23     3     c -0.03337353 -0.44963794 -0.33840975
## 24     4     c  0.36144400 -0.64332503 -0.55811539
## 25     5     c  1.04557564 -0.51074555  1.02781348
## 26     6     c  0.10321239  0.25720201 -0.22547048
## 27     7     c  0.33179556 -0.41955545 -1.23163005
## 28     8     c -1.56855881 -0.95222766 -0.75824474
## 29     9     c  0.44026994  0.51239341  1.08551815
## 30    10     c  1.88187132 -1.74426769 -1.04909888
```

```
interpm(dat, 'time', c('a', 'b', 'c'), by = 'group', rule = 2)
```

```
##    time group           a           b           c
## 1     1     a -0.46930021  1.34910627 -0.49751241
## 2     2     a -1.14800275 -1.63508277  0.76558578
## 3     3     a  1.10399796 -0.71553273  0.50139307
## 4     4     a -0.28924992 -0.91649432  0.33191117
## 5     5     a -0.26252925 -0.68709924  0.38024607
## 6     6     a -0.23580858 -0.45770417  0.42858097
## 7     7     a -0.20908791 -0.22830909  0.47691586
## 8     8     a -0.18236724  0.00108599  0.52525076
## 9     9     a -0.15564657  0.23048107  0.57358566
## 10   10     a -0.12892591  0.45987615  0.62192056
## 11    1     b  0.29911231  0.16770583 -1.47180517
## 12    2     b  0.01829921 -0.27500302  0.79819546
## 13    3     b -1.15006133  0.49232262  0.27946251
## 14    4     b -0.42939635  1.33975457  0.65787426
## 15    5     b  0.85000298 -0.47674422  0.59372632
## 16    6     b -0.21482949 -1.49679554 -0.57792651
## 17    7     b -0.61741402 -1.20142397  0.47606273
## 18    8     b  0.10942738 -0.40746103 -1.18763362
## 19    9     b -0.70651106 -0.94774810  0.71768805
## 20   10     b -0.70651106  0.85166640  0.13469724
## 21    1     c  0.35080172 -0.58843101  1.42208034
## 22    2     c  0.15871409 -1.36247310  0.04073091
## 23    3     c -0.03337353 -0.44963794 -0.33840975
## 24    4     c  0.36144400 -0.64332503 -0.55811539
## 25    5     c  1.04557564 -0.51074555  1.02781348
## 26    6     c  0.10321239  0.25720201 -0.22547048
## 27    7     c  0.33179556 -0.41955545 -1.23163005
## 28    8     c -1.56855881 -0.95222766 -0.75824474
## 29    9     c  0.44026994  0.51239341  1.08551815
## 30   10     c  1.88187132 -1.74426769 -1.04909888
```

```r
dat <- data.table::as.data.table(dat)
dat
```

```
##       time  group           a          b           c
##      <int> <char>       <num>      <num>       <num>
##   1:     1      a -0.46930021  1.3491063 -0.49751241
##   2:     2      a -1.14800275 -1.6350828  0.76558578
##   3:     3      a  1.10399796 -0.7155327  0.50139307
##   4:     4      a -0.28924992 -0.9164943  0.33191117
##   5:     5      a          NA         NA          NA
##   6:     6      a          NA         NA          NA
##   7:     7      a          NA         NA          NA
##   8:     8      a          NA         NA          NA
##   9:     9      a          NA         NA          NA
##  10:    10      a -0.12892591  0.4598761  0.62192056
##  11:     1      b  0.29911231  0.1677058 -1.47180517
##  12:     2      b  0.01829921 -0.2750030  0.79819546
##  13:     3      b -1.15006133  0.4923226  0.27946251
##  14:     4      b -0.42939635  1.3397546  0.65787426
##  15:     5      b  0.85000298 -0.4767442  0.59372632
##  16:     6      b -0.21482949 -1.4967955 -0.57792651
##  17:     7      b -0.61741402 -1.2014240  0.47606273
##  18:     8      b  0.10942738 -0.4074610 -1.18763362
##  19:     9      b -0.70651106 -0.9477481  0.71768805
##  20:    10      b          NA  0.8516664  0.13469724
##  21:     1      c  0.35080172 -0.5884310  1.42208034
##  22:     2      c          NA -1.3624731  0.04073091
##  23:     3      c -0.03337353 -0.4496379 -0.33840975
##  24:     4      c  0.36144400 -0.6433250 -0.55811539
##  25:     5      c  1.04557564 -0.5107456  1.02781348
##  26:     6      c  0.10321239  0.2572020 -0.22547048
##  27:     7      c  0.33179556 -0.4195554 -1.23163005
##  28:     8      c -1.56855881 -0.9522277 -0.75824474
##  29:     9      c  0.44026994  0.5123934  1.08551815
##  30:    10      c  1.88187132 -1.7442677 -1.04909888
##       time  group           a          b           c
```

```r
interpm(dat, 'time', c('a', 'b', 'c'), by = 'group')
```

```
##       time  group           a           b           c
##      <int> <char>       <num>       <num>       <num>
##   1:     1      a -0.46930021  1.34910627 -0.49751241
##   2:     2      a -1.14800275 -1.63508277  0.76558578
##   3:     3      a  1.10399796 -0.71553273  0.50139307
##   4:     4      a -0.28924992 -0.91649432  0.33191117
##   5:     5      a -0.26252925 -0.68709924  0.38024607
##   6:     6      a -0.23580858 -0.45770417  0.42858097
##   7:     7      a -0.20908791 -0.22830909  0.47691586
##   8:     8      a -0.18236724  0.00108599  0.52525076
##   9:     9      a -0.15564657  0.23048107  0.57358566
##  10:    10      a -0.12892591  0.45987615  0.62192056
##  11:     1      b  0.29911231  0.16770583 -1.47180517
##  12:     2      b  0.01829921 -0.27500302  0.79819546
##  13:     3      b -1.15006133  0.49232262  0.27946251
##  14:     4      b -0.42939635  1.33975457  0.65787426
## 15:     5      b  0.85000298 -0.47674422  0.59372632
## 16:     6      b -0.21482949 -1.49679554 -0.57792651
## 17:     7      b -0.61741402 -1.20142397  0.47606273
## 18:     8      b  0.10942738 -0.40746103 -1.18763362
## 19:     9      b -0.70651106 -0.94774810  0.71768805
## 20:    10      b          NA  0.85166640  0.13469724
## 21:     1      c  0.35080172 -0.58843101  1.42208034
## 22:     2      c  0.15871409 -1.36247310  0.04073091
## 23:     3      c -0.03337353 -0.44963794 -0.33840975
## 24:     4      c  0.36144400 -0.64332503 -0.55811539
## 25:     5      c  1.04557564 -0.51074555  1.02781348
## 26:     6      c  0.10321239  0.25720201 -0.22547048
## 27:     7      c  0.33179556 -0.41955545 -1.23163005
## 28:     8      c -1.56855881 -0.95222766 -0.75824474
## 29:     9      c  0.44026994  0.51239341  1.08551815
## 30:    10      c  1.88187132 -1.74426769 -1.04909888
##      time  group           a           b           c
```

```r
interpm(dat, 'time', c('a', 'b', 'c'), by = 'group', rule = 2)
```

```
##      time  group           a           b           c
##     <int> <char>       <num>       <num>       <num>
##  1:     1      a -0.46930021  1.34910627 -0.49751241
##  2:     2      a -1.14800275 -1.63508277  0.76558578
##  3:     3      a  1.10399796 -0.71553273  0.50139307
##  4:     4      a -0.28924992 -0.91649432  0.33191117
##  5:     5      a -0.26252925 -0.68709924  0.38024607
##  6:     6      a -0.23580858 -0.45770417  0.42858097
##  7:     7      a -0.20908791 -0.22830909  0.47691586
##  8:     8      a -0.18236724  0.00108599  0.52525076
##  9:     9      a -0.15564657  0.23048107  0.57358566
## 10:    10      a -0.12892591  0.45987615  0.62192056
## 11:     1      b  0.29911231  0.16770583 -1.47180517
## 12:     2      b  0.01829921 -0.27500302  0.79819546
## 13:     3      b -1.15006133  0.49232262  0.27946251
## 14:     4      b -0.42939635  1.33975457  0.65787426
## 15:     5      b  0.85000298 -0.47674422  0.59372632
## 16:     6      b -0.21482949 -1.49679554 -0.57792651
## 17:     7      b -0.61741402 -1.20142397  0.47606273
## 18:     8      b  0.10942738 -0.40746103 -1.18763362
## 19:     9      b -0.70651106 -0.94774810  0.71768805
## 20:    10      b -0.70651106  0.85166640  0.13469724
## 21:     1      c  0.35080172 -0.58843101  1.42208034
## 22:     2      c  0.15871409 -1.36247310  0.04073091
## 23:     3      c -0.03337353 -0.44963794 -0.33840975
## 24:     4      c  0.36144400 -0.64332503 -0.55811539
## 25:     5      c  1.04557564 -0.51074555  1.02781348
## 26:     6      c  0.10321239  0.25720201 -0.22547048
## 27:     7      c  0.33179556 -0.41955545 -1.23163005
## 28:     8      c -1.56855881 -0.95222766 -0.75824474
## 29:     9      c  0.44026994  0.51239341  1.08551815
## 30:    10      c  1.88187132 -1.74426769 -1.04909888
##      time  group           a           b           c
```

logaxis

Add log axis to base R plots.

logistic

The logistic function for transformations.

rbindf

Like `rbind` but data frame columns do not need to match. From monitoR package.

rounddf

Round complete data frames.

```
dat <- data.frame(a = 1:10, b = rnorm(10), c = letters[1:10])
dat
```

```
##     a           b c
## 1   1  0.29039955 a
## 2   2 -0.44757343 b
## 3   3 -0.21886077 c
## 4   4 -1.60544351 d
## 5   5  0.07483969 e
## 6   6 -0.52191870 f
## 7   7 -0.06490237 g
## 8   8  1.05136997 h
## 9   9 -1.74215826 i
## 10 10  1.73254803 j
```

```
rounddf(dat)
```

```
##     a     b c
## 1   1  0.29 a
## 2   2 -0.45 b
## 3   3 -0.22 c
## 4   4 -1.61 d
## 5   5  0.07 e
## 6   6 -0.52 f
## 7   7 -0.06 g
## 8   8  1.05 h
## 9   9 -1.74 i
## 10 10  1.73 j
```

```
rounddf(dat, digits = c(0, 4))
```

```
## Warning in rounddf(dat, digits = c(0, 4)): First value in digits repeated to
## match length.
```

```
##     a       b c
## 1   1  0.2904 a
## 2   2 -0.4476 b
## 3   3 -0.2189 c
## 4   4 -1.6054 d
## 5   5  0.0748 e
## 6   6 -0.5219 f
## 7   7 -0.0649 g
## 8   8  1.0514 h
## 9   9 -1.7422 i
## 10 10  1.7325 j
```

```r
rounddf(dat, digits = c(0, 4), func = signif)
```

```
## Warning in rounddf(dat, digits = c(0, 4), func = signif): First value in digits
## repeated to match length.
```

```
##     a        b c
## 1   1  0.29040 a
## 2   2 -0.44760 b
## 3   3 -0.21890 c
## 4   4 -1.60500 d
## 5   5  0.07484 e
## 6   6 -0.52190 f
## 7   7 -0.06490 g
## 8   8  1.05100 h
## 9   9 -1.74200 i
## 10 10  1.73300 j
```

```r
rounddf(dat, digits = c(2, 2), func = signif)
```

```
## Warning in rounddf(dat, digits = c(2, 2), func = signif): First value in digits
## repeated to match length.
```

```
##     a      b c
## 1   1  0.290 a
## 2   2 -0.450 b
## 3   3 -0.220 c
## 4   4 -1.600 d
## 5   5  0.075 e
## 6   6 -0.520 f
## 7   7 -0.065 g
## 8   8  1.100 h
## 9   9 -1.700 i
## 10 10  1.700 j
```

Trailing zeroes are dropped when written out (although this does not show up in R console). Avoid with `pad = TRUE`, which converts adds trailing zeroes and converts column to character.

```r
set.seed(124)
dat <- data.frame(a = 1:10, b = rnorm(10), c = letters[1:10])
dat
```

```
##     a           b c
## 1   1 -1.38507062 a
## 2   2  0.03832318 b
## 3   3 -0.76303016 c
## 4   4  0.21230614 d
## 5   5  1.42553797 e
## 6   6  0.74447982 f
## 7   7  0.70022940 g
## 8   8 -0.22935461 h
## 9   9  0.19709386 i
## 10 10  1.20715377 j
```

```
summary(dat)
```

```
##        a                b                  c            
##  Min.   : 1.00   Min.   :-1.3851   Length:10         
##  1st Qu.: 3.25   1st Qu.:-0.1624   Class :character  
##  Median : 5.50   Median : 0.2047   Mode  :character  
##  Mean   : 5.50   Mean   : 0.2148                     
##  3rd Qu.: 7.75   3rd Qu.: 0.7334                     
##  Max.   :10.00   Max.   : 1.4255                     
```

```
rounddf(dat)
```

```
##     a     b c
## 1   1 -1.39 a
## 2   2  0.04 b
## 3   3 -0.76 c
## 4   4  0.21 d
## 5   5  1.43 e
## 6   6  0.74 f
## 7   7  0.70 g
## 8   8 -0.23 h
## 9   9  0.20 i
## 10 10  1.21 j
```

```
rounddf(dat, pad = TRUE)
```

```
##     a     b c
## 1   1 -1.39 a
## 2   2  0.04 b
## 3   3 -0.76 c
## 4   4  0.21 d
## 5   5  1.43 e
## 6   6  0.74 f
## 7   7  0.70 g
## 8   8 -0.23 h
## 9   9  0.20 i
## 10 10  1.21 j
```

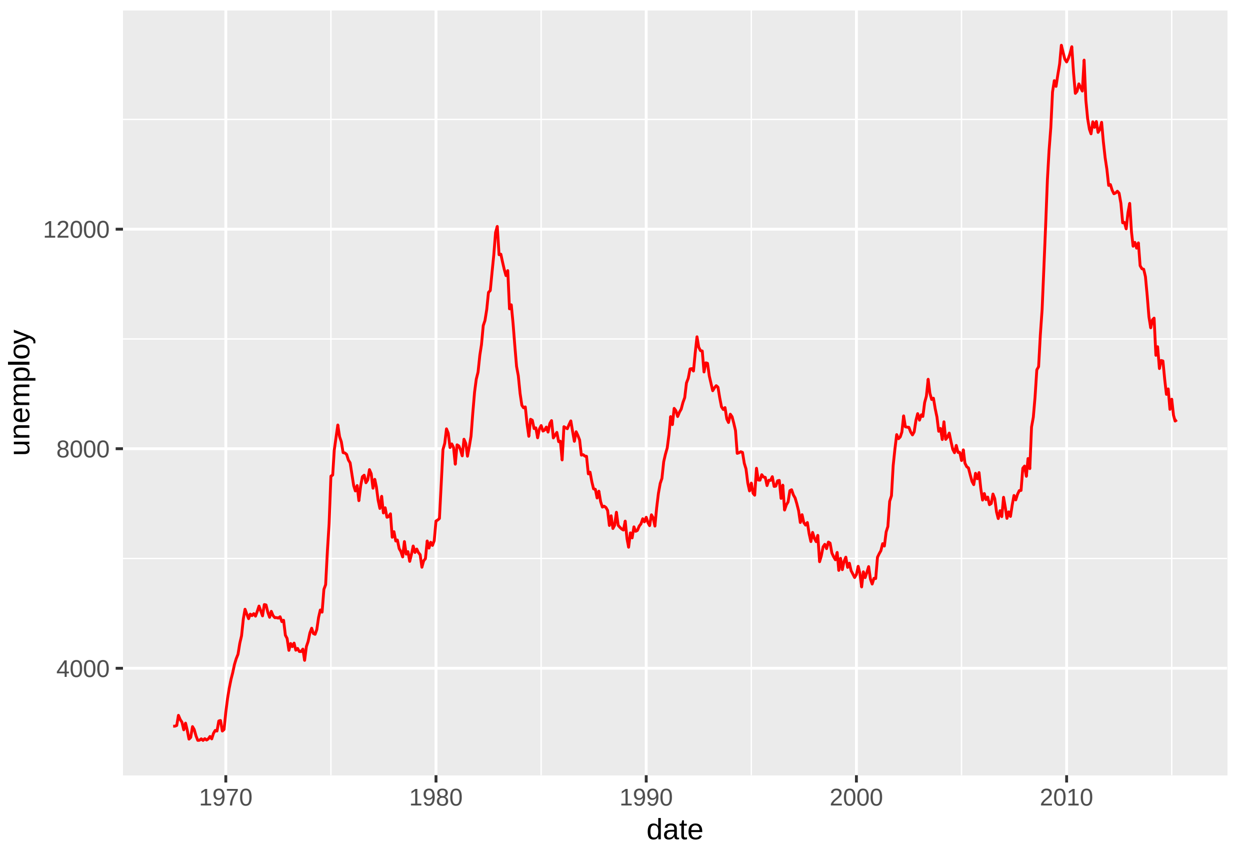
```
dat <- rounddf(dat, pad = TRUE)
summary(dat)
```

```
##        a               b                  c            
##  Min.   : 1.00   Length:10          Length:10         
##  1st Qu.: 3.25   Class :character   Class :character  
##  Median : 5.50   Mode  :character   Mode  :character  
##  Mean   : 5.50                                        
##  3rd Qu.: 7.75                                        
##  Max.   :10.00                                        
```

ggsave2x

Save a ggplot2 figure in more than one format in a single call.

```
library(ggplot2)
ggplot(economics, aes(date, unemploy)) +
  geom_line(colour = "red")
```



```
ggsave2x('economics', width = 5, height = 5)
```

Saves png and pdf by default, add more with `type` argument. Use `...` optional arguments for more flexibility.

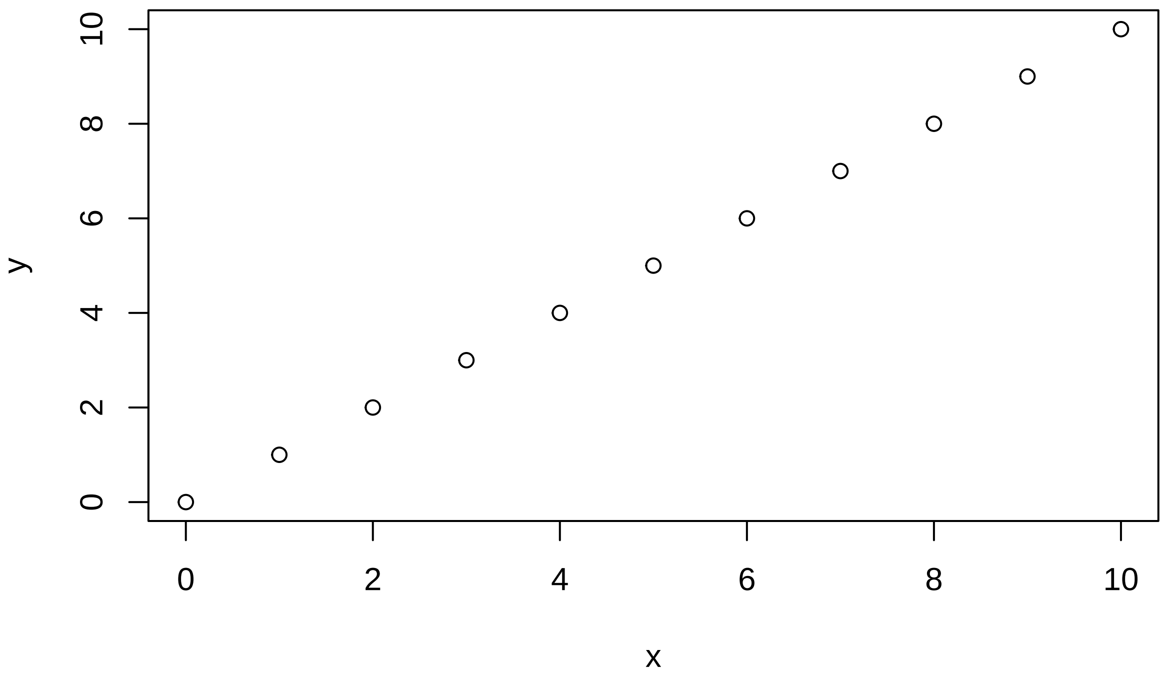
`mintegrate`

Integrate *f*lux measurements for emission.

```
source('mintegrate.R')
```

1. Linear

```
x <- 0:10
y <- 0:10
plot(x, y)
```



Exact integral is `10 * 10 / 2 = 50`.

```r
mintegrate(x, y, 'midpoint')
```

```
## [1]  0.0  0.5  2.0  4.5  8.0 12.5 18.0 24.5 32.0 40.5 50.0
```

```r
mintegrate(x, y, 'left')
```

```
## [1]  0  1  3  6 10 15 21 28 36 45 55
```

```r
mintegrate(x, y, 'right')
```

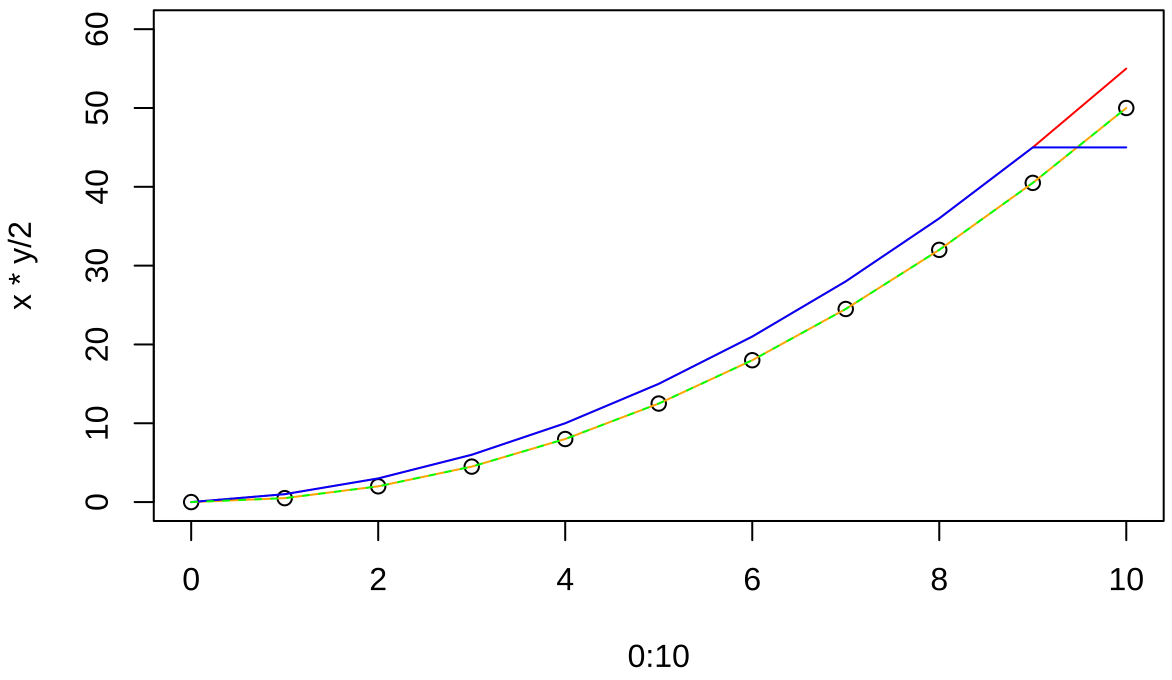
```
## [1]  0  1  3  6 10 15 21 28 36 45 45
```

```r
mintegrate(x, y, 'trap')
```

```
## [1]  0.0  0.5  2.0  4.5  8.0 12.5 18.0 24.5 32.0 40.5 50.0
```

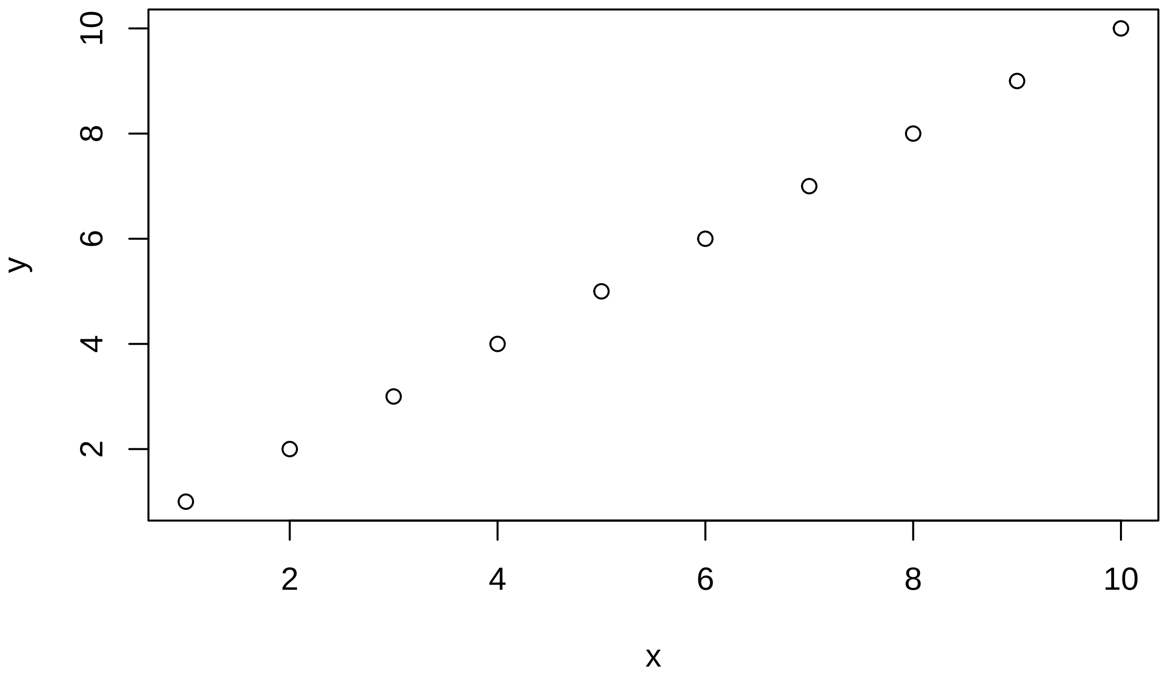
Note differences on the way up.

```r
plot(0:10, x * y / 2, ylim = c(0, 60))
lines(0:10, mintegrate(x, y, 'midpoint'), col = 'orange')
lines(0:10, mintegrate(x, y, 'left'), col = 'red')
lines(0:10, mintegrate(x, y, 'right'), col = 'blue')
lines(0:10, mintegrate(x, y, 'trap'), col = 'green', lty = 2)
```



Leave out 0 (say first measurement is at time = 1).

```r
x <- 1:10
y <- 1:10
plot(x, y)
```



Exact integral depends on what occurred before t = 1.

```r
mintegrate(x, y, 'midpoint')
```

```
##  [1]  0.0  1.5  4.0  7.5 12.0 17.5 24.0 31.5 40.0 49.5
```

```r
mintegrate(x, y, 'left')
```

```
##  [1]  0  2  5  9 14 20 27 35 44 54
```

```r
mintegrate(x, y, 'right')
```

```
##  [1]  1  3  6 10 15 21 28 36 45 45
```

```r
mintegrate(x, y, 'trap')
```

```
##  [1]  0.0  1.5  4.0  7.5 12.0 17.5 24.0 31.5 40.0 49.5
```

Can incorporate assumptions.

```r
mintegrate(x, y, 'midpoint', lwr = 0)
```

```
##  [1]  0.5  2.0  4.5  8.0 12.5 18.0 24.5 32.0 40.5 50.0
```

```r
mintegrate(x, y, 'left', lwr = 0)
```

```
##  [1]  1  3  6 10 15 21 28 36 45 55
```

```r
mintegrate(x, y, 'right', lwr = 0)
```

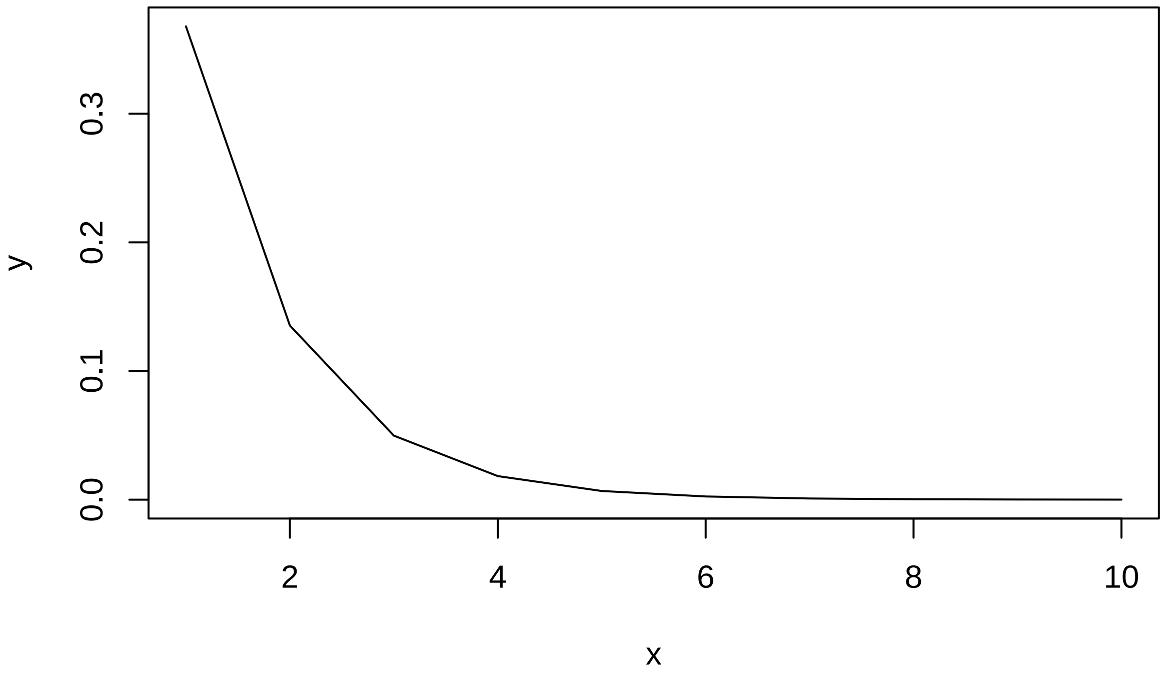
```
##  [1]  1  3  6 10 15 21 28 36 45 45
```

```r
mintegrate(x, y, 'trap', lwr = 0, ylwr = 0)
```

```
##  [1]  0.5  2.0  4.5  8.0 12.5 18.0 24.5 32.0 40.5 50.0
```

Nonlinear

```r
x <- 1:10
y <- exp(-x)
plot(x, y, type = 'l')
```



Exact integral from 1:10 is `exp(-10) - exp(-1)` = 0.3678. From 0 it is 1.0.

```r
mintegrate(x, y, 'midpoint', value = 'total')
```

```
## [1] 0.3979879
```

```r
mintegrate(x, y, 'left', value = 'total')
```

```
## [1] 0.2140708
```

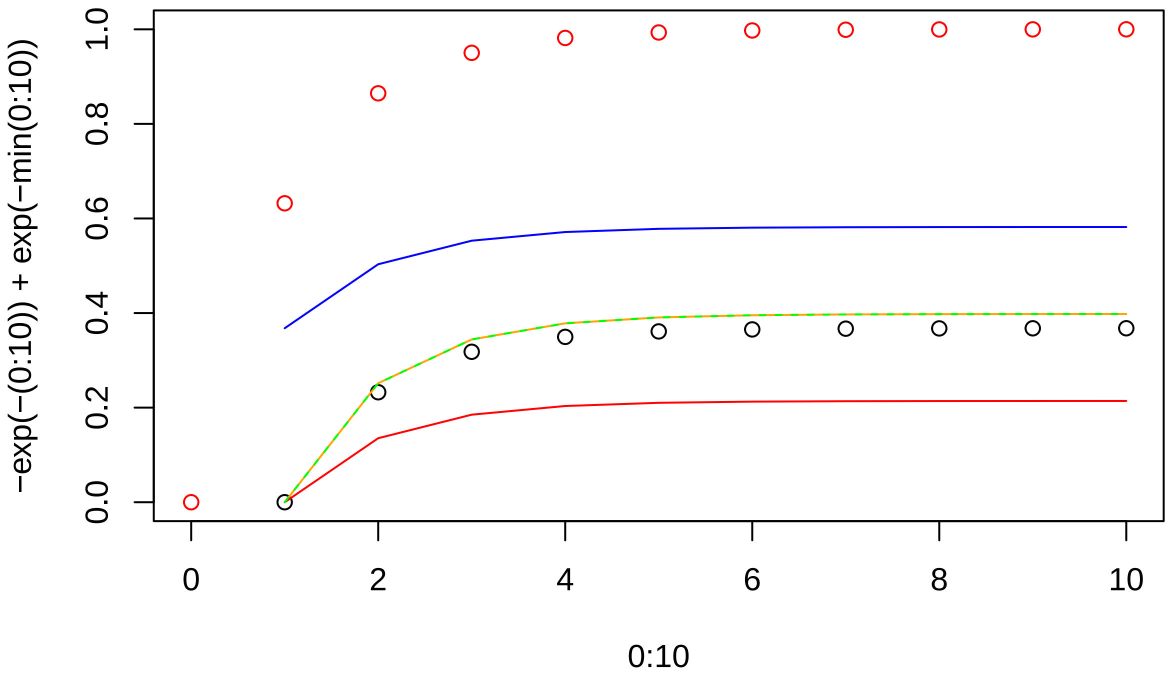
```r
mintegrate(x, y, 'right', value = 'total')
```

```
## [1] 0.5819049
```

```r
mintegrate(x, y, 'trap', value = 'total')
```

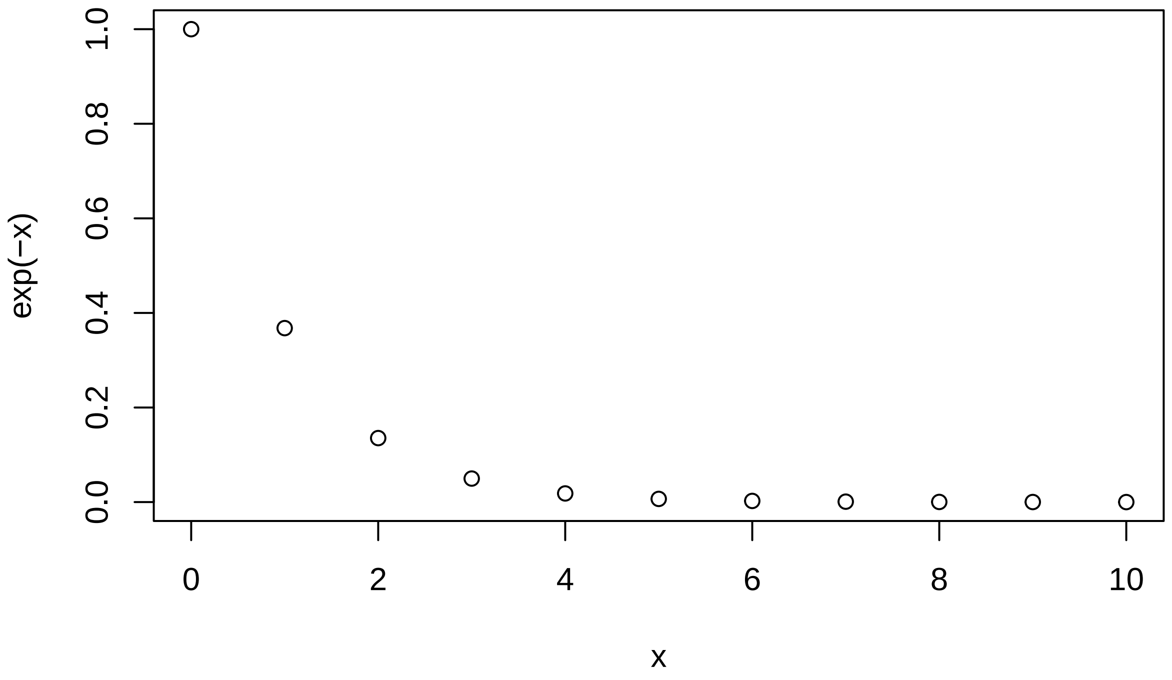
```
## [1] 0.3979879
```

```r
plot(0:10, -exp(-(0:10)) + exp(-min(0:10)), col = 'red')
points(x, -exp(-x) + exp(-min(x)), ylim = c(0, 0.7))
lines(x, mintegrate(x, y, 'midpoint'), col = 'orange')
lines(x, mintegrate(x, y, 'left'), col = 'red')
lines(x, mintegrate(x, y, 'right'), col = 'blue')
lines(x, mintegrate(x, y, 'trap'), col = 'green', lty = 2)
```



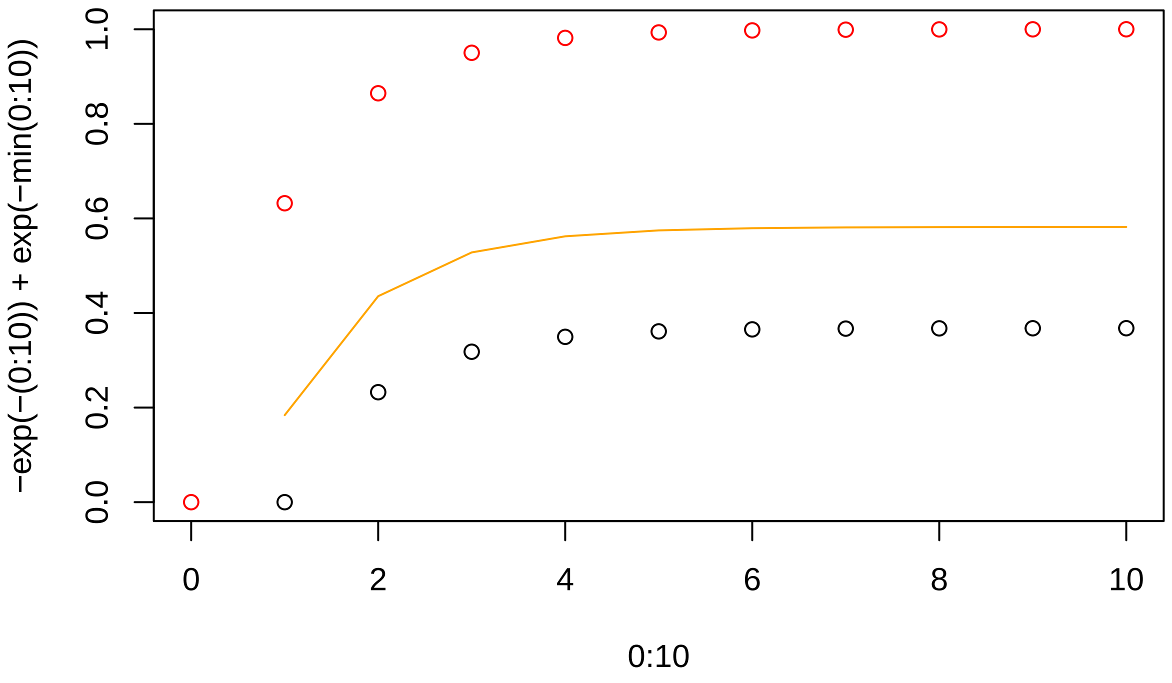
None is perfect, but midpoint and trapezoid (identical in this implementation) are the best, only slightly overestimating. Note that they all do poorly compared to a true integral that starts at 0 (red points). This cannot really be helped–how could we infer the true high values of y close to 0 from these limited measurements?

```r
x <- 0:10
plot(x, exp(-x))
```



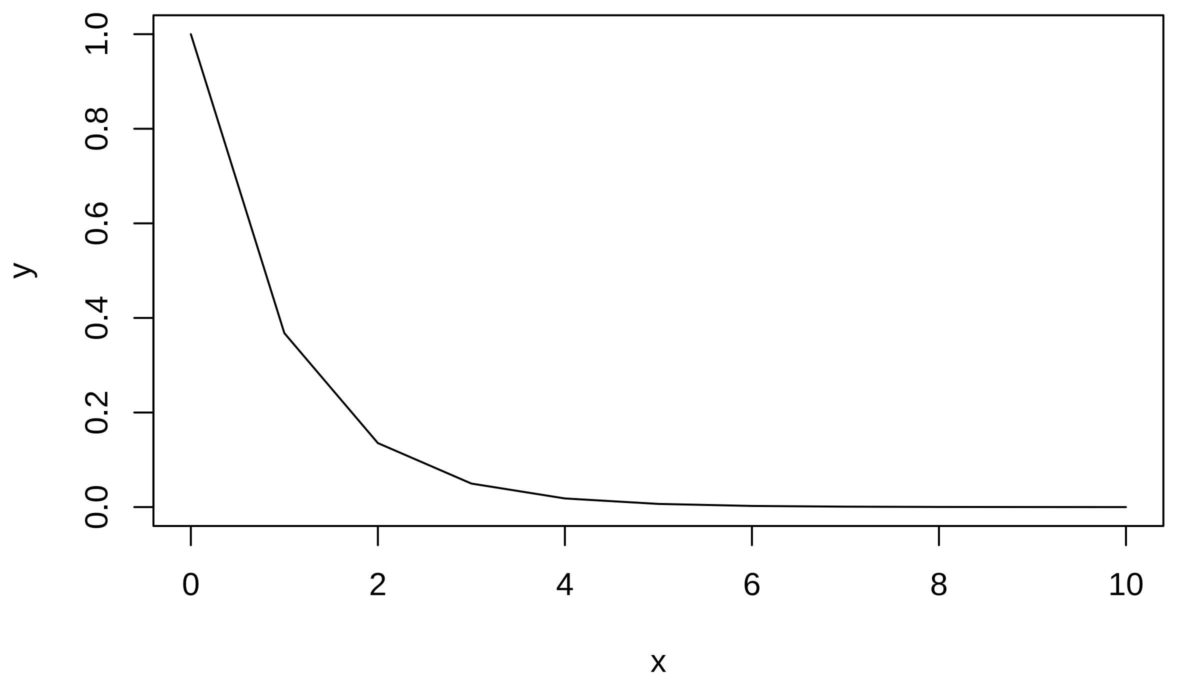
The `lwr` argument can extend the first rate back to 0 or any arbitrary starting point, which helps a bit.

```r
x <- 1:10
plot(0:10, -exp(-(0:10)) + exp(-min(0:10)), col = 'red')
points(x, -exp(-x) + exp(-min(x)), ylim = c(0, 0.7))
lines(x, mintegrate(x, y, 'midpoint', lwr = 0), col = 'orange')
```



But measurements are needed at or closer to 0 to do really well with this function. Start at 0.

```r
x <- 0:10
y <- exp(-x)
plot(x, y, type = 'l')
```



```
mintegrate(x, y, 'midpoint', value = 'total')
```

```
## [1] 1.081928
```

```
mintegrate(x, y, 'left', value = 'total')
```

```
## [1] 0.5819503
```

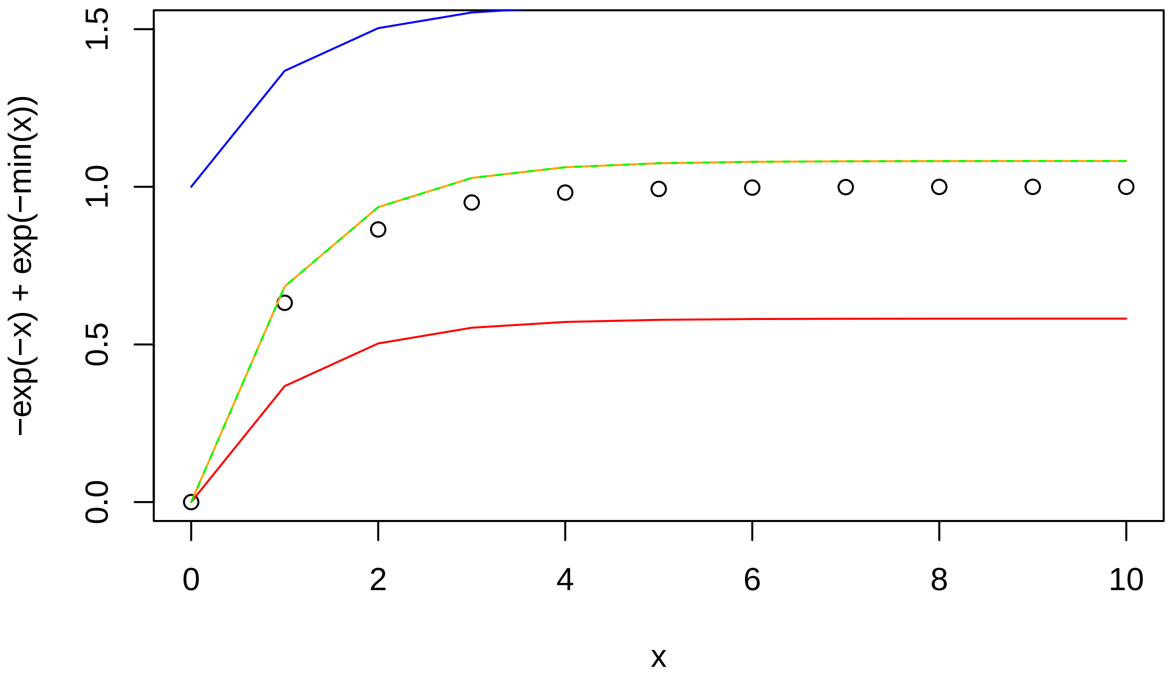
```
mintegrate(x, y, 'right', value = 'total')
```

```
## [1] 1.581905
```

```
mintegrate(x, y, 'trap', value = 'total')
```

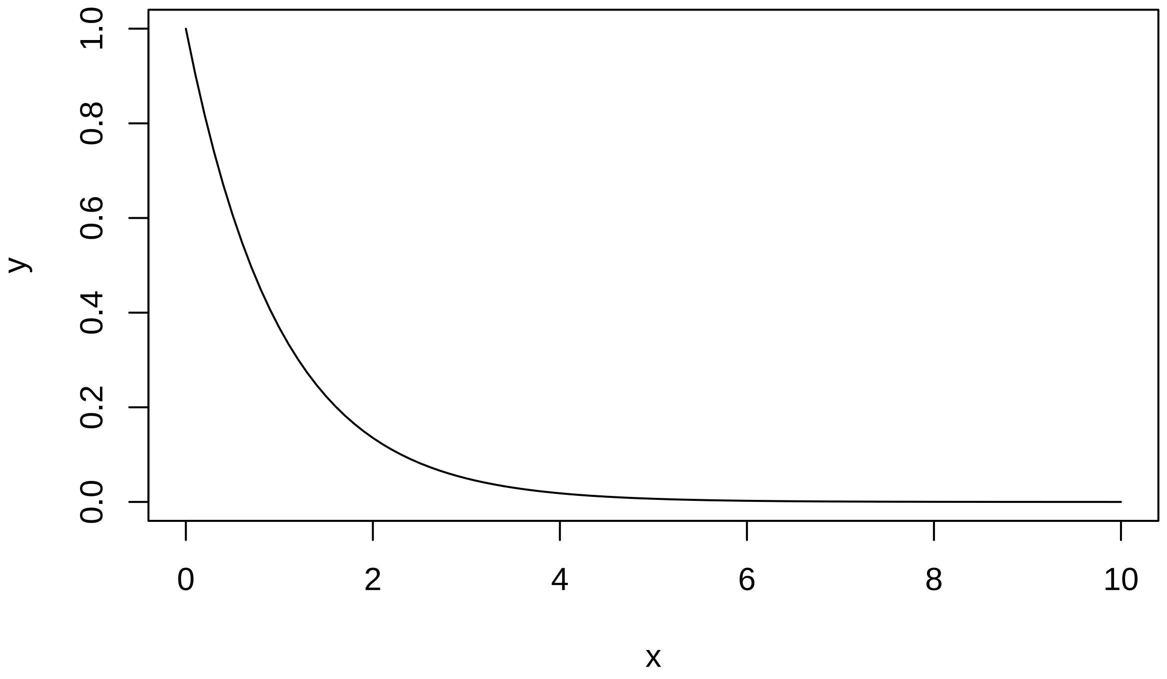
```
## [1] 1.081928
```

```
plot(x, -exp(-x) + exp(-min(x)), ylim = c(0, 1.5))
lines(x, mintegrate(x, y, 'midpoint'), col = 'orange')
lines(x, mintegrate(x, y, 'left'), col = 'red')
lines(x, mintegrate(x, y, 'right'), col = 'blue')
lines(x, mintegrate(x, y, 'trap'), col = 'green', lty = 2)
```



We can prove that all methods become accurate with very high resolution.

```r
x <- 0:100 / 10
y <- exp(-x)
plot(x, y, type = 'l')
```



```r
mintegrate(x, y, 'midpoint', value = 'total')
```

```
## [1] 1.000788
```

```r
mintegrate(x, y, 'left', value = 'total')
```

```
## [1] 0.95079
```

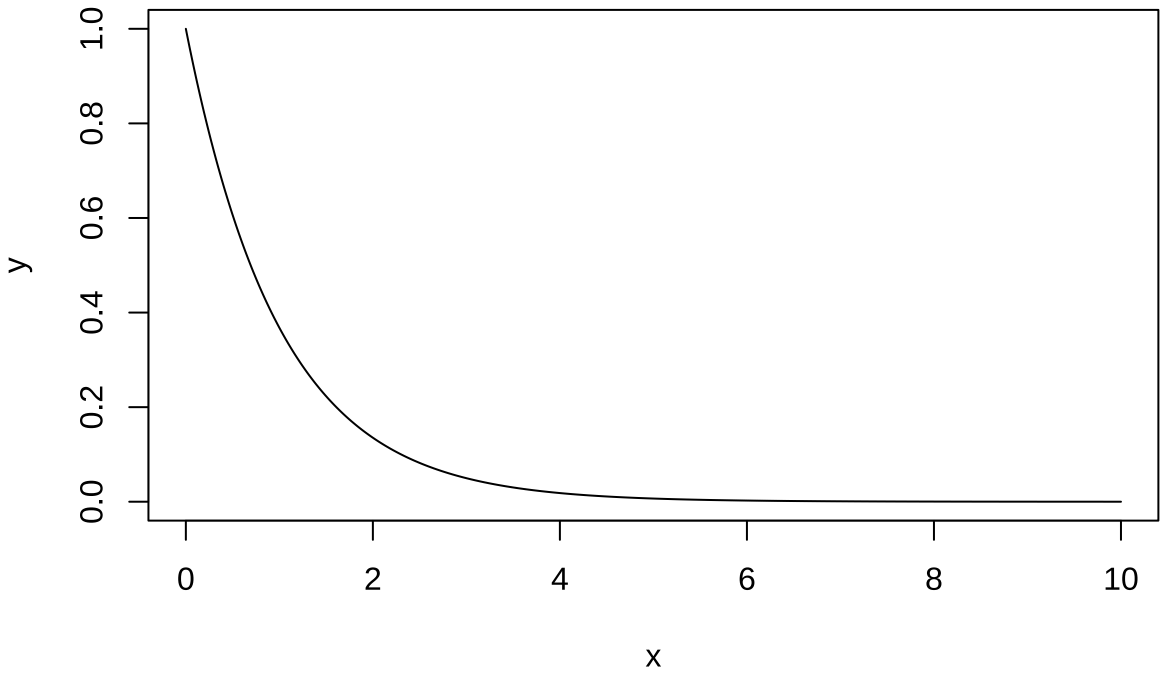
```r
mintegrate(x, y, 'right', value = 'total')
```

```
## [1] 1.050785
```

```r
mintegrate(x, y, 'trap', value = 'total')
```

```
## [1] 1.000788
```

```r
x <- 0:10000 / 1000
y <- exp(-x)
plot(x, y, type = 'l')
```



```r
mintegrate(x, y, 'midpoint', value = 'total')
```

```
## [1] 0.9999547
```

```r
mintegrate(x, y, 'left', value = 'total')
```

```
## [1] 0.9994547
```

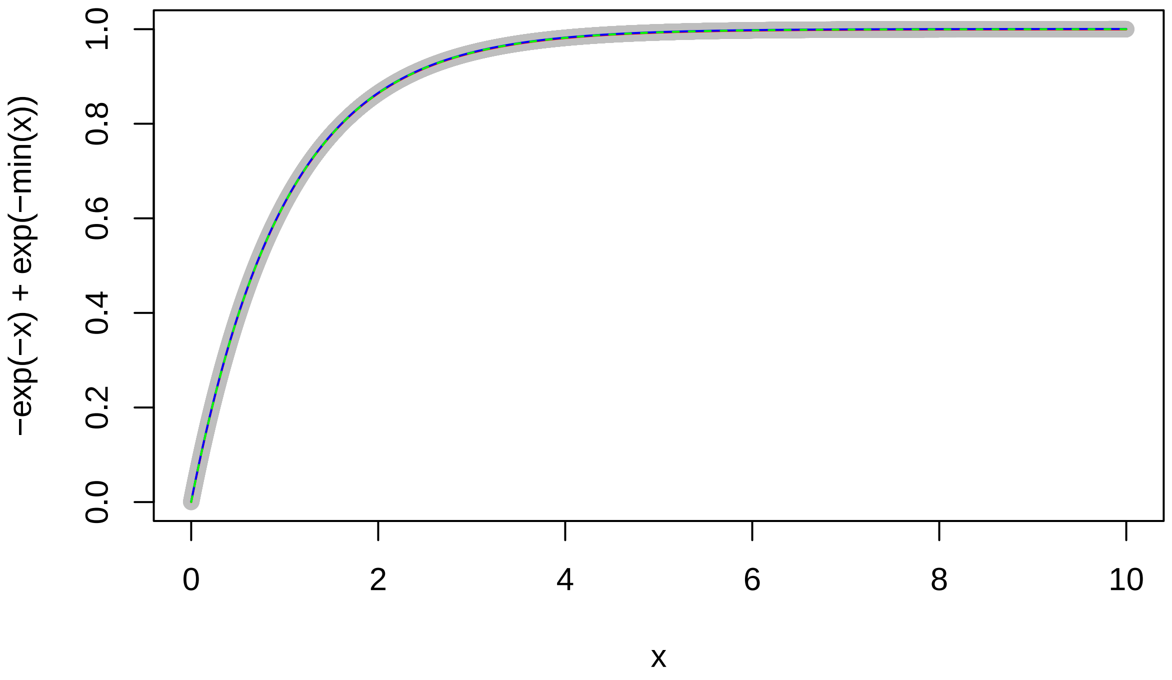
```r
mintegrate(x, y, 'right', value = 'total')
```

```
## [1] 1.000455
```

```r
mintegrate(x, y, 'trap', value = 'total')
```

```
## [1] 0.9999547
```

```r
plot(x, -exp(-x) + exp(-min(x)), col = 'gray')
lines(x, mintegrate(x, y, 'midpoint'), col = 'orange')
lines(x, mintegrate(x, y, 'left'), col = 'red')
lines(x, mintegrate(x, y, 'right'), col = 'blue')
lines(x, mintegrate(x, y, 'trap'), col = 'green', lty = 2)
```



Note that data need not be sorted by x.

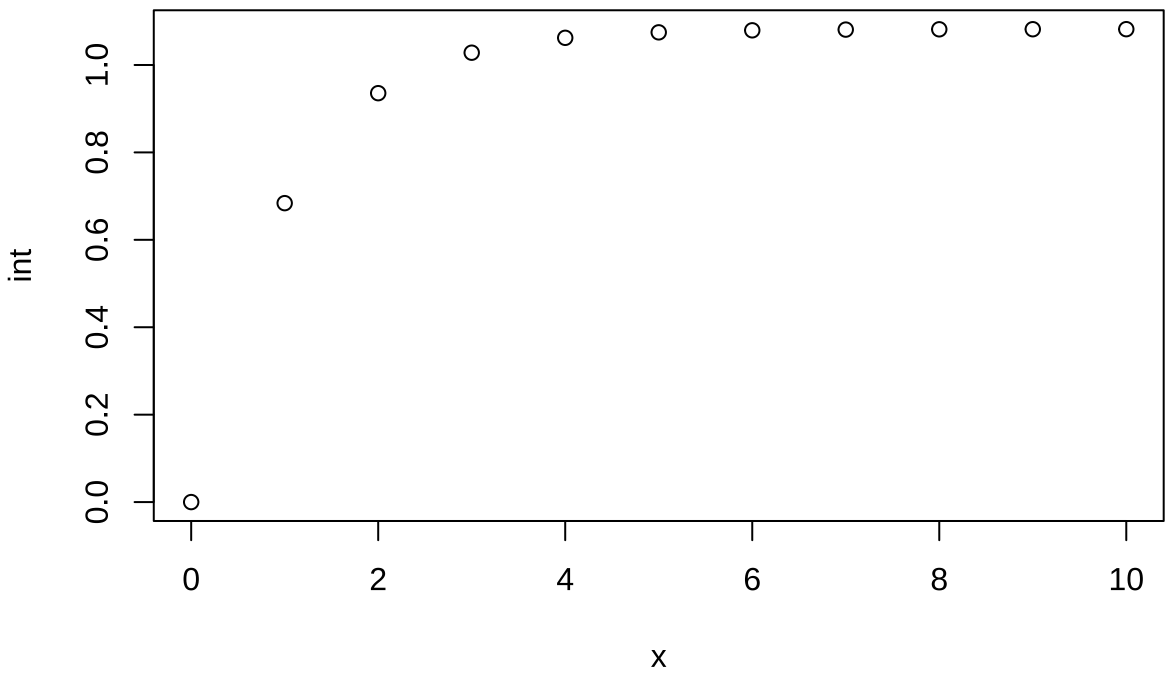
```
x <- 0:10
y <- exp(-x)
```

```
mintegrate(x, y, 'midpoint')
```

```
##  [1] 0.0000000 0.6839397 0.9355471 1.0281083 1.0621596 1.0746864 1.0792948
##  [8] 1.0809901 1.0816137 1.0818432 1.0819276
```

```
x[1] <- 4
x[5] <- 0
y <- exp(-x)
```

```
int <- mintegrate(x, y, 'midpoint')
plot(x, int)
```



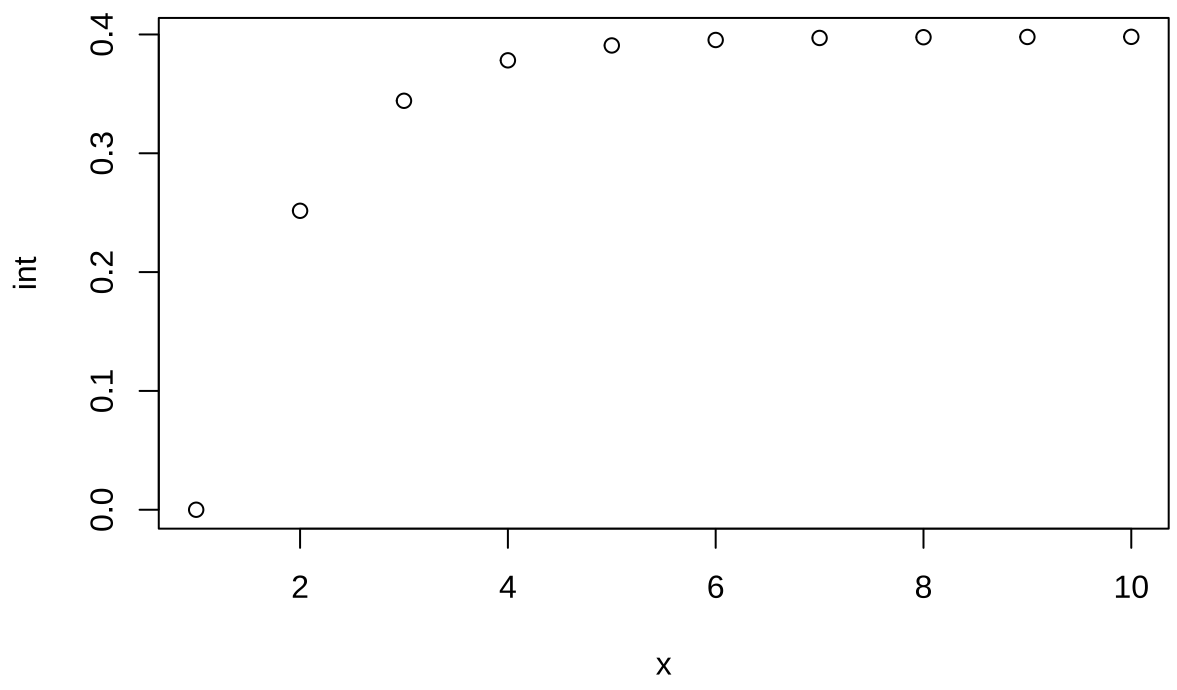
difftime

```r
now <- Sys.time()
x <- difftime(now, now - 1:10)
y <- exp(-as.numeric(x))
```

```r
int <- mintegrate(x, y)
```

```
## Warning in mintegrate(x, y): Converting x to numeric. Check values with value =
## "xy".
```

```r
plot(x, int)
```



```
mintegrate(x, y, value = 'xy')
```

```
## Warning in mintegrate(x, y, value = "xy"): Converting x to numeric. Check
## values with value = "xy".
```

```
##       [,1]      [,2]
##  [1,]    1 0.0000000
##  [2,]    2 0.2516074
##  [3,]    3 0.3441685
##  [4,]    4 0.3782199
##  [5,]    5 0.3907467
##  [6,]    6 0.3953550
##  [7,]    7 0.3970504
##  [8,]    8 0.3976740
##  [9,]    9 0.3979035
## [10,]   10 0.3979879
```

With different units, result will differ. It is up to the user to make sure y and x have same time unit!

```
x <- difftime(now, now - 1:10, units = 'hours')
y <- exp(-as.numeric(x * 3600))
```

```
mintegrate(x, y, value = 'xy')
```

```
## Warning in mintegrate(x, y, value = "xy"): Converting x to numeric. Check
## values with value = "xy".
```

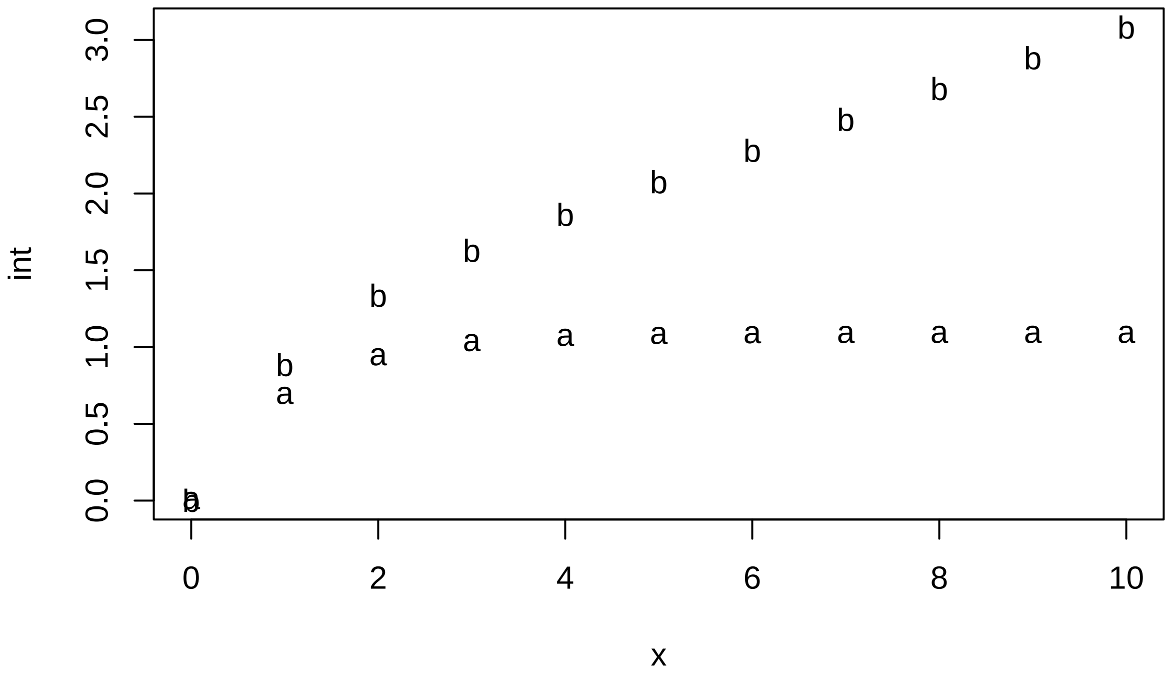
```
##               [,1]         [,2]
##  [1,] 0.0002777778 0.000000e+00
##  [2,] 0.0005555556 6.989093e-05
##  [3,] 0.0008333333 9.560237e-05
##  [4,] 0.0011111111 1.050611e-04
##  [5,] 0.0013888889 1.085407e-04
##  [6,] 0.0016666667 1.098208e-04
##  [7,] 0.0019444444 1.102918e-04
##  [8,] 0.0022222222 1.104650e-04
##  [9,] 0.0025000000 1.105287e-04
## [10,] 0.0027777778 1.105522e-04
```

Grouped

```
x <- 0:10
y <- exp(-x)
```

```
x <- c(x, x)
y <- c(y, y + 0.2)
g <- rep(c('a', 'b'), each = 11)
```

```
int <- mintegrate(x, y, by = g)
plot(x, int, pch = g)
```



consec

```
source('consec.R')

x <- data.frame(a = 1:20, b = c(1, 1, 1, 2, 2, 2, 4, 4, 5, 10, 10, 10, 10, 0, 0, 0, 0, 1, 1, 2))

x$group <- consec(x$b)
x
```

```
##     a  b group
## 1   1  1     1
## 2   2  1     1
## 3   3  1     1
## 4   4  2     2
## 5   5  2     2
## 6   6  2     2
## 7   7  4     3
## 8   8  4     3
## 9   9  5     4
## 10 10 10     5
## 11 11 10     5
## 12 12 10     5
## 13 13 10     5
## 14 14  0     6
## 15 15  0     6
## 16 16  0     6
## 17 17  0     6
## 18 18  1     7
## 19 19  1     7
## 20 20  2     8
```

```
x$group
```

```
##  [1] 1 1 1 2 2 2 3 3 4 5 5 5 5 6 6 6 6 7 7 8
```

```
x$group <- consec(x$b, value = 'f')
x
```

```
##      a  b group
## 1    1  1     1
## 2    2  1     1
## 3    3  1     1
## 4    4  2     2
## 5    5  2     2
## 6    6  2     2
## 7    7  4     3
## 8    8  4     3
## 9    9  5     4
## 10 10 10     5
## 11 11 10     5
## 12 12 10     5
## 13 13 10     5
## 14 14  0     6
## 15 15  0     6
## 16 16  0     6
## 17 17  0     6
## 18 18  1     7
## 19 19  1     7
## 20 20  2     8
```

```
x$group
```

```
##  [1] 1 1 1 2 2 2 3 3 4 5 5 5 5 6 6 6 6 7 7 8
## Levels: 1 2 3 4 5 6 7 8
```

With character variable.

```
x <- data.frame(a = 1:20, b = letters[c(1, 1, 1, 2, 2, 2, 4, 4, 5, 10, 10, 10, 10, 9, 9, 9, 9, 1, 1, 2)]

x$group <- consec(x$b)
x
```

```
##     a b group
## 1   1 a     1
## 2   2 a     1
## 3   3 a     1
## 4   4 b     2
## 5   5 b     2
## 6   6 b     2
## 7   7 d     3
## 8   8 d     3
## 9   9 e     4
## 10 10 j     5
## 11 11 j     5
## 12 12 j     5
## 13 13 j     5
## 14 14 i     6
## 15 15 i     6
## 16 16 i     6
## 17 17 i     6
## 18 18 a     7
## 19 19 a     7
## 20 20 b     8
```

```
x$group
```

```
##  [1] 1 1 1 2 2 2 3 3 4 5 5 5 5 6 6 6 6 7 7 8
```

```
x$group <- consec(x$b, value = 'f')
x
```

```
##     a b group
## 1   1 a     1
## 2   2 a     1
## 3   3 a     1
## 4   4 b     2
## 5   5 b     2
## 6   6 b     2
## 7   7 d     3
## 8   8 d     3
## 9   9 e     4
## 10 10 j     5
## 11 11 j     5
## 12 12 j     5
## 13 13 j     5
## 14 14 i     6
## 15 15 i     6
## 16 16 i     6
## 17 17 i     6
## 18 18 a     7
## 19 19 a     7
## 20 20 b     8
```

```
x$group
```

```
##  [1] 1 1 1 2 2 2 3 3 4 5 5 5 5 6 6 6 6 7 7 8
## Levels: 1 2 3 4 5 6 7 8
```