DoE

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```
library('lhs')
library(ggplot2)
library(corrplot)
```

```
## corrplot 0.92 loaded
```

```
s <- optimumLHS(90,11)
s
```

```
##               [,1]        [,2]        [,3]       [,4]         [,5]        [,6]
##  [1,] 0.0842115082 0.306789060 0.831554531 0.34426159 0.5474060086 0.280578212
##  [2,] 0.5679137893 0.582444829 0.062188725 0.22530313 0.1013660234 0.195481197
##  [3,] 0.0676164876 0.968240604 0.527622518 0.08651912 0.8120235638 0.717720099
##  [4,] 0.4729383687 0.961329109 0.375203486 0.66831321 0.5088212984 0.608418173
##  [5,] 0.5332473155 0.235169892 0.772178650 0.68967567 0.3809170516 0.078764929
##  [6,] 0.4487347568 0.546753586 0.729130551 0.61325912 0.3027525987 0.153391059
##  [7,] 0.2147997491 0.932104277 0.285999234 0.89021059 0.2356970383 0.067074985
##  [8,] 0.9689230804 0.989688843 0.599203107 0.37134284 0.0271511319 0.587156378
##  [9,] 0.3977116868 0.865617195 0.485753563 0.20916521 0.6245504488 0.128751041
## [10,] 0.5048929770 0.352784425 0.787518756 0.63344947 0.9844506541 0.512556957
## [11,] 0.2284543471 0.454384366 0.877236666 0.28813243 0.6926726657 0.756335947
## [12,] 0.7916823327 0.340436708 0.834632264 0.37982187 0.5935951907 0.469857104
## [13,] 0.9842219987 0.558767555 0.411483159 0.56309562 0.7920265837 0.038381332
## [14,] 0.8115488370 0.645210329 0.105889309 0.94298739 0.7644626238 0.898203697
## [15,] 0.4247408955 0.164113298 0.849163859 0.96284091 0.3925869207 0.549246398
## [16,] 0.0439898714 0.462927732 0.032835894 0.64777879 0.2187359289 0.365247875
## [17,] 0.6365684272 0.110019166 0.517661980 0.47729782 0.6508365166 0.671985515
## [18,] 0.5459713876 0.614247875 0.864424010 0.82192412 0.0952363614 0.942462162
## [19,] 0.7102651388 0.372116879 0.627955377 0.74004196 0.1946105245 0.988929223
## [20,] 0.4887239517 0.903542142 0.900770846 0.16164173 0.9086074557 0.466523422
## [21,] 0.7507769648 0.716834684 0.929550345 0.01706658 0.4476837279 0.811958377
## [22,] 0.0299545448 0.222037482 0.666637285 0.06658135 0.9608924044 0.562954273
## [23,] 0.1616978366 0.888115020 0.508663201 0.94445851 0.0391085715 0.924725488
## [24,] 0.1714226057 0.763927332 0.675524515 0.63280550 0.6866228321 0.728058215
## [25,] 0.3672449981 0.396910666 0.749374793 0.52642164 0.3365135666 0.678385994
## [26,] 0.6116756126 0.124714251 0.406158171 0.25905256 0.5159595920 0.879072260
## [27,] 0.1115473768 0.847221959 0.939983257 0.91260249 0.1360756899 0.652501732
## [28,] 0.5364880127 0.807239355 0.323229005 0.27134165 0.8736342990 0.237529677
## [29,] 0.9557573059 0.500270242 0.388979783 0.44607336 0.0201022990 0.487305414
## [30,] 0.0946673560 0.049642932 0.897450595 0.12251656 0.9151798523 0.105626074
## [31,] 0.9323201005 0.895183900 0.162376061 0.04352452 0.7209745499 0.205998766
## [32,] 0.8443826091 0.738378499 0.454547296 0.51696735 0.9435052419 0.985509967
## [33,] 0.9902635954 0.260331627 0.586035295 0.98142206 0.2923601941 0.439248365
```

```
## [34,] 0.6268959296 0.400707099 0.914548709 0.25345402 0.6036328031 0.015906622
## [35,] 0.0188025291 0.567459941 0.572382734 0.79986163 0.6575245385 0.140567254
## [36,] 0.5865999053 0.280622917 0.268795225 0.18238339 0.9305335813 0.306514268
## [37,] 0.1402843883 0.145056551 0.238038980 0.53941294 0.2332175813 0.258165214
## [38,] 0.6859259304 0.477573887 0.813614276 0.10097441 0.7051975549 0.445003485
## [39,] 0.6082885730 0.294709049 0.646932696 0.14726474 0.7303585173 0.835063128
## [40,] 0.9555458434 0.041355917 0.183366043 0.54992774 0.8967137298 0.332806401
## [41,] 0.6572310011 0.142452739 0.543085232 0.57422312 0.6394877482 0.871596324
## [42,] 0.2437420322 0.189325339 0.634999832 0.60307984 0.4923922278 0.808425781
## [43,] 0.1836828950 0.524279972 0.245656917 0.83349926 0.3332583724 0.775146177
## [44,] 0.8804610284 0.434753850 0.293413030 0.97300749 0.0858181358 0.744023560
## [45,] 0.7244954017 0.799952181 0.681604162 0.13770017 0.8635006335 0.542099475
## [46,] 0.3808920843 0.684808798 0.257070245 0.30237637 0.9898625182 0.962924682
## [47,] 0.2767896397 0.828117001 0.216294594 0.67944900 0.6767041743 0.863449428
## [48,] 0.2967881855 0.086062967 0.977260571 0.41188893 0.8468020151 0.061228145
## [49,] 0.3164978291 0.705363408 0.457138767 0.07092864 0.4570937818 0.696800679
## [50,] 0.8558268407 0.772929035 0.563370097 0.48313874 0.5396486508 0.352343664
## [51,] 0.8320381586 0.589276769 0.046505970 0.39832799 0.4840508572 0.951309073
## [52,] 0.4946794506 0.172033178 0.333698037 0.72483699 0.5290621362 0.341408109
## [53,] 0.2471436100 0.416551001 0.071843606 0.36142394 0.3685557967 0.745807561
## [54,] 0.4159654601 0.489473119 0.443846490 0.11296831 0.5713585176 0.659526051
## [55,] 0.9368333562 0.273999414 0.966591280 0.42691589 0.1198706566 0.497712817
## [56,] 0.0625044017 0.606258226 0.117140099 0.32942650 0.9552660002 0.703189002
## [57,] 0.7741231695 0.727362589 0.091180881 0.09455432 0.0493582948 0.183077602
## [58,] 0.3536763658 0.356692687 0.137345993 0.74699812 0.4027560971 0.046899021
## [59,] 0.7170691837 0.378891275 0.694403456 0.21479842 0.4736559654 0.246713133
## [60,] 0.9037645204 0.207590273 0.425994228 0.29529208 0.1807712037 0.393261606
## [61,] 0.7569246189 0.635582595 0.880979676 0.23968837 0.7671782440 0.028180516
## [62,] 0.2101511841 0.249338547 0.740104662 0.41066985 0.1669983839 0.915327680
## [63,] 0.8674844885 0.745975388 0.192001536 0.90887650 0.1547301841 0.113685673
## [64,] 0.3079299807 0.112467726 0.036572612 0.58521124 0.3501389154 0.318478489
## [65,] 0.4609360883 0.003388238 0.954103763 0.43793385 0.6129498119 0.780056163
## [66,] 0.3644002822 0.543263332 0.793851093 0.75912956 0.3658630475 0.002471728
## [67,] 0.9143760761 0.811639510 0.758600124 0.65900706 0.5558630338 0.591790439
## [68,] 0.6513070548 0.067276325 0.983427192 0.85279641 0.8439602097 0.633766302
## [69,] 0.4086316670 0.057779506 0.131052320 0.50531114 0.7351700175 0.792444175
## [70,] 0.3394171504 0.486922043 0.712933673 0.19459242 0.2847508562 0.156205020
## [71,] 0.3276858537 0.014727700 0.801199421 0.88753074 0.5882310555 0.294625769
## [72,] 0.8474462991 0.870114565 0.203357711 0.86218883 0.9715327343 0.614668190
## [73,] 0.8967475134 0.785291115 0.315472601 0.49717992 0.8074120857 0.907587079
## [74,] 0.5154853419 0.949062887 0.017460752 0.16960005 0.8287181307 0.855117811
## [75,] 0.7395087077 0.432982696 0.082539226 0.46517583 0.7464394698 0.411701299
## [76,] 0.7779375673 0.658302385 0.621939960 0.82631474 0.2449035471 0.424760950
## [77,] 0.6666882340 0.515268382 0.993487426 0.70205637 0.0769815510 0.524104191
## [78,] 0.2596153680 0.980177306 0.226795870 0.59049566 0.2703157199 0.099149783
## [79,] 0.2883288085 0.094684669 0.600340479 0.71816888 0.1233349412 0.386164359
## [80,] 0.4423798478 0.332210669 0.150003225 0.31977621 0.0005420153 0.572683076
## [81,] 0.1293728334 0.025828668 0.385661666 0.04481071 0.4221362014 0.216976673
## [82,] 0.5666012552 0.841243087 0.554270506 0.98921968 0.1603061129 0.222945673
## [83,] 0.8027026964 0.698071552 0.349712091 0.00159704 0.0593260633 0.168052567
## [84,] 0.1998298961 0.231656449 0.307192477 0.87064268 0.2648982267 0.967207544
## [85,] 0.0003670803 0.320646184 0.490631177 0.92530978 0.4403031922 0.504766480
## [86,] 0.5996237555 0.186667589 0.003879584 0.81007562 0.4231275739 0.400369576
## [87,] 0.6977602869 0.671282817 0.172519618 0.34971278 0.8845958717 0.830964611
```

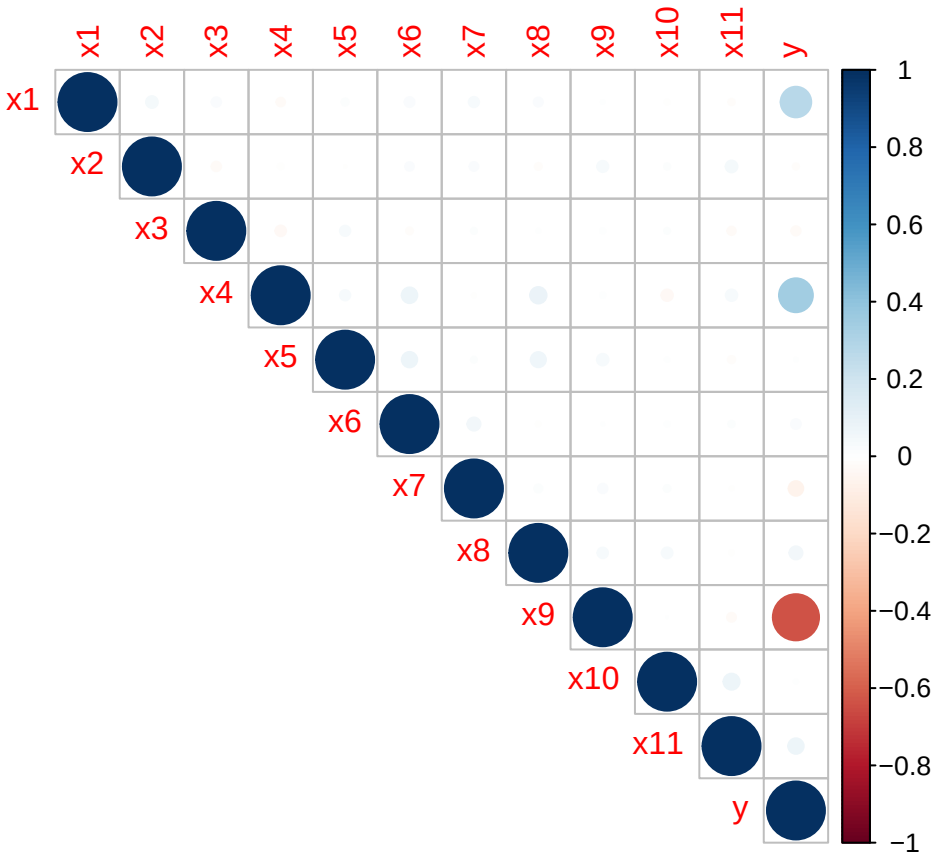
```
## [88,] 0.1084908213 0.915795222 0.472377401 0.78442277 0.7779349667 0.277258456
## [89,] 0.1513856397 0.626430891 0.708374510 0.02244070 0.3163447524 0.624307801
## [90,] 0.0495853266 0.940891578 0.356452782 0.76912127 0.2081687504 0.367973545
##             [,7]        [,8]        [,9]       [,10]       [,11]
##  [1,] 0.12080937 0.542628014 0.669584203 0.154356152 0.915388701
##  [2,] 0.54358107 0.060181909 0.549616005 0.559147317 0.393945864
##  [3,] 0.10131848 0.361662483 0.938062998 0.699224615 0.516794284
##  [4,] 0.37606989 0.355349561 0.821194410 0.061764549 0.813750678
##  [5,] 0.86039616 0.883598444 0.760664916 0.143593561 0.358032005
##  [6,] 0.15742475 0.224012937 0.009288402 0.627229267 0.709194600
##  [7,] 0.01483475 0.648227626 0.155838382 0.833929807 0.220748969
##  [8,] 0.47665241 0.286535872 0.512821433 0.277527316 0.424108646
##  [9,] 0.61078959 0.998268101 0.869423461 0.222749828 0.881722851
## [10,] 0.42245720 0.141120041 0.838176524 0.261866164 0.040741663
## [11,] 0.99618108 0.237903790 0.628773956 0.639132389 0.855388158
## [12,] 0.00142709 0.959047210 0.727834186 0.334216288 0.680918018
## [13,] 0.52397248 0.013966292 0.216115496 0.819569903 0.486235475
## [14,] 0.30195667 0.367621884 0.137251156 0.493465132 0.091538313
## [15,] 0.21557590 0.691883070 0.314979584 0.528443681 0.067438676
## [16,] 0.64886146 0.711458353 0.367385619 0.254157686 0.972215876
## [17,] 0.94827177 0.426268473 0.262056404 0.975696586 0.246332801
## [18,] 0.70830098 0.643639139 0.403848327 0.965072828 0.729340105
## [19,] 0.42071731 0.099452925 0.917213238 0.301381083 0.401845946
## [20,] 0.45569810 0.434314156 0.712081749 0.743480436 0.507819428
## [21,] 0.33982713 0.213018758 0.054190163 0.396286820 0.330366792
## [22,] 0.75336002 0.472657723 0.502440647 0.438581734 0.308305274
## [23,] 0.58771765 0.444640695 0.603513534 0.188958580 0.113008310
## [24,] 0.81541632 0.574700232 0.067711825 0.672659098 0.241620298
## [25,] 0.85065247 0.120869051 0.360596506 0.187463059 0.026075180
## [26,] 0.39949715 0.804098142 0.247113170 0.949844385 0.522728408
## [27,] 0.72699171 0.166657980 0.897939772 0.680245371 0.661385185
## [28,] 0.07785443 0.146621046 0.733678044 0.920959931 0.064627953
## [29,] 0.22847703 0.105745559 0.964432432 0.870967581 0.471307061
## [30,] 0.29589279 0.512371871 0.589208999 0.428404620 0.623822363
## [31,] 0.73744349 0.554430184 0.855319782 0.907138558 0.445461548
## [32,] 0.64242214 0.530274709 0.987146240 0.131898769 0.909932687
## [33,] 0.18366018 0.411164739 0.579828919 0.008729598 0.930802292
## [34,] 0.35689620 0.083579042 0.310034027 0.829211593 0.874429400
## [35,] 0.25709958 0.626598688 0.945281303 0.864752778 0.746885052
## [36,] 0.15249413 0.322852047 0.910632993 0.281985741 0.411160759
## [37,] 0.34732361 0.002058678 0.446338014 0.329575676 0.312943668
## [38,] 0.78260894 0.305677812 0.774231056 0.713025066 0.995275683
## [39,] 0.09732097 0.260243630 0.693672136 0.176199671 0.137683968
## [40,] 0.45460129 0.766465939 0.102578959 0.810120157 0.178420931
## [41,] 0.31636531 0.069906818 0.281063967 0.552004805 0.051095161
## [42,] 0.23616409 0.829867762 0.855624313 0.119211429 0.163246779
## [43,] 0.12887910 0.604554701 0.433568020 0.930535966 0.567466503
## [44,] 0.06762836 0.500571685 0.239397922 0.704945335 0.617153073
## [45,] 0.06197573 0.709619993 0.228604491 0.032830269 0.583889069
## [46,] 0.38494266 0.913346925 0.041133062 0.798573967 0.744397694
## [47,] 0.21099354 0.976997142 0.927267671 0.620071276 0.636599514
## [48,] 0.88567705 0.385875447 0.096300585 0.101915371 0.375147366
## [49,] 0.84169154 0.123916803 0.155236376 0.655017990 0.843297567
## [50,] 0.97464660 0.249623032 0.329732344 0.855524906 0.804545886
```

```
## [51,] 0.80836776 0.681317666 0.526104702 0.344809063 0.824720693
## [52,] 0.26894498 0.864215836 0.012755666 0.078763747 0.350891346
## [53,] 0.77369544 0.924696905 0.999303653 0.893068844 0.123010738
## [54,] 0.61754317 0.738336272 0.056530955 0.076237425 0.698715665
## [55,] 0.71350145 0.836962176 0.087097863 0.597211539 0.936279540
## [56,] 0.92763604 0.187217512 0.347487411 0.745340400 0.596959613
## [57,] 0.25184724 0.340013860 0.535220659 0.012136819 0.780756392
## [58,] 0.57699437 0.034606933 0.490186370 0.036687208 0.292468264
## [59,] 0.13389233 0.769239791 0.800343764 0.993137789 0.201167552
## [60,] 0.93616706 0.903146827 0.799484449 0.359723538 0.434046002
## [61,] 0.43697057 0.726683748 0.423062105 0.417232390 0.263530316
## [62,] 0.27940270 0.299847516 0.681718788 0.402757330 0.979359892
## [63,] 0.66186281 0.478836555 0.201524240 0.217640251 0.675239116
## [64,] 0.68078284 0.024863345 0.663762701 0.758920201 0.767086002
## [65,] 0.92143408 0.868752959 0.033162379 0.467123124 0.649340030
## [66,] 0.98637894 0.599415784 0.387568287 0.879357896 0.170253258
## [67,] 0.02725734 0.664183407 0.653705791 0.782591114 0.281891994
## [68,] 0.88920116 0.789242168 0.974035847 0.586411243 0.561360142
## [69,] 0.75791496 0.201835678 0.276234809 0.046717175 0.538444641
## [70,] 0.04514909 0.670374754 0.455776868 0.935774844 0.545707496
## [71,] 0.51039063 0.194754716 0.168997596 0.311865311 0.862495273
## [72,] 0.82257280 0.616979095 0.556670496 0.768705607 0.961183409
## [73,] 0.87654383 0.846899915 0.783131708 0.090686825 0.193809221
## [74,] 0.32632094 0.275304871 0.482946865 0.542378936 0.604082228
## [75,] 0.19451873 0.983333505 0.196475160 0.295810979 0.756168132
## [76,] 0.49038481 0.943994402 0.744478820 0.984112563 0.899418792
## [77,] 0.51323091 0.407534727 0.887390561 0.573413787 0.017740946
## [78,] 0.47923028 0.944539679 0.477766955 0.166295272 0.388725632
## [79,] 0.17601179 0.819420167 0.832753663 0.466577042 0.718200156
## [80,] 0.40691296 0.782454638 0.112168207 0.382969507 0.223768739
## [81,] 0.56625023 0.495978241 0.181552556 0.511308441 0.001506011
## [82,] 0.69968467 0.321103273 0.343662377 0.610745893 0.148982742
## [83,] 0.63308147 0.899873884 0.396881623 0.206050184 0.459626005
## [84,] 0.95943272 0.391395671 0.128981774 0.242320396 0.949087847
## [85,] 0.90331570 0.457564713 0.619178400 0.724688281 0.272255530
## [86,] 0.67396542 0.560693534 0.640057159 0.661405361 0.085486053
## [87,] 0.03690332 0.582887489 0.414939944 0.372781049 0.103697431
## [88,] 0.55484439 0.051590191 0.567301054 0.483437734 0.492813186
## [89,] 0.79575158 0.166749768 0.703462830 0.502262231 0.339427958
## [90,] 0.59837482 0.747066973 0.290938667 0.453525161 0.795431084
```

```
data <- read.table(file="exp.csv", sep=",", header=T)
data$y <- as.numeric(data$y)
names(data)
```

```
##  [1] "x1"  "x2"  "x3"  "x4"  "x5"  "x6"  "x7"  "x8"  "x9"  "x10" "x11" "y"
```

```
mat.cor=cor(data)
corrplot(mat.cor, type="upper")
```




```
cor.test(data$y, data$x1)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x1
## t = 5.503, df = 360, p-value = 7.104e-08
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.1806646 0.3709770
## sample estimates:
##       cor
## 0.2785529
```

```
cor.test(data$y, data$x2)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x2
## t = -0.21881, df = 360, p-value = 0.8269
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.11447123  0.09165275
## sample estimates:
##         cor
## -0.01153174
```

```
cor.test(data$y, data$x3)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x3
## t = -0.48553, df = 360, p-value = 0.6276
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.12831837  0.07769927
## sample estimates:
##         cor
## -0.02558116
```

```
cor.test(data$y, data$x4)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x4
## t = 6.884, df = 360, p-value = 2.599e-11
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.2466580 0.4290543
## sample estimates:
##       cor
## 0.3410623
```

```
cor.test(data$y, data$x5)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x5
## t = 0.079368, df = 360, p-value = 0.9368
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.09893518  0.10721236
## sample estimates:
##         cor
## 0.004183028
```

```
cor.test(data$y, data$x6)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x6
## t = 0.54035, df = 360, p-value = 0.5893
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.07482767  0.13115815
## sample estimates:
##        cor
## 0.02846745
```

```
cor.test(data$y, data$x7)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x7
## t = -1.2072, df = 360, p-value = 0.2281
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.16549005  0.03983866
## sample estimates:
##         cor
## -0.06349764
```

```
cor.test(data$y, data$x8)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x8
## t = 0.95904, df = 360, p-value = 0.3382
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.05286926  0.15276206
## sample estimates:
##        cor
## 0.05048139
```

```
cor.test(data$y, data$x9)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x9
## t = -15.576, df = 360, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6923076 -0.5686246
## sample estimates:
##        cor
## -0.6345107
```

```
cor.test(data$y, data$x10)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x10
## t = 0.10728, df = 360, p-value = 0.9146
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.09747838  0.10866621
## sample estimates:
##         cor
## 0.005653981
```

```
cor.test(data$y, data$x11)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$y and data$x11
## t = 1.3595, df = 360, p-value = 0.1749
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.03184345  0.17326587
## sample estimates:
##        cor
## 0.07146668
```

```
regm=lm(y~x1 + x2 + x3 + x4 + x5 + x6 + x7 + x8 + x9 + x10 + x11, data=data)
summary(regm)
```

```
##
## Call:
## lm(formula = y ~ x1 + x2 + x3 + x4 + x5 + x6 + x7 + x8 + x9 +
##     x10 + x11, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.57281 -0.21662 -0.08814  0.36402  1.16271
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.91474    0.16269   5.623 3.85e-08 ***
## x1           0.91516    0.10498   8.717  < 2e-16 ***
## x2           0.00835    0.10263   0.081    0.935
## x3          -0.04894    0.10375  -0.472    0.637
## x4           1.09029    0.10508  10.376  < 2e-16 ***
## x5           0.04173    0.10306   0.405    0.686
## x6          -0.00722    0.10516  -0.069    0.945
## x7          -0.16886    0.10271  -1.644    0.101
## x8           0.11283    0.10335   1.092    0.276
## x9          -1.97954    0.10341 -19.143  < 2e-16 ***
## x10          0.05650    0.10346   0.546    0.585
## x11          0.13811    0.10374   1.331    0.184
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.568 on 350 degrees of freedom
## Multiple R-squared:  0.6134, Adjusted R-squared:  0.6012
## F-statistic: 50.48 on 11 and 350 DF,  p-value: < 2.2e-16
```

```
anova(regm)
```

```
## Analysis of Variance Table
##
## Response: y
##            Df  Sum Sq Mean Sq  F value    Pr(>F)
## x1          1  22.665  22.665  70.2401 1.294e-15 ***
## x2          1   0.156   0.156   0.4836   0.48728
```

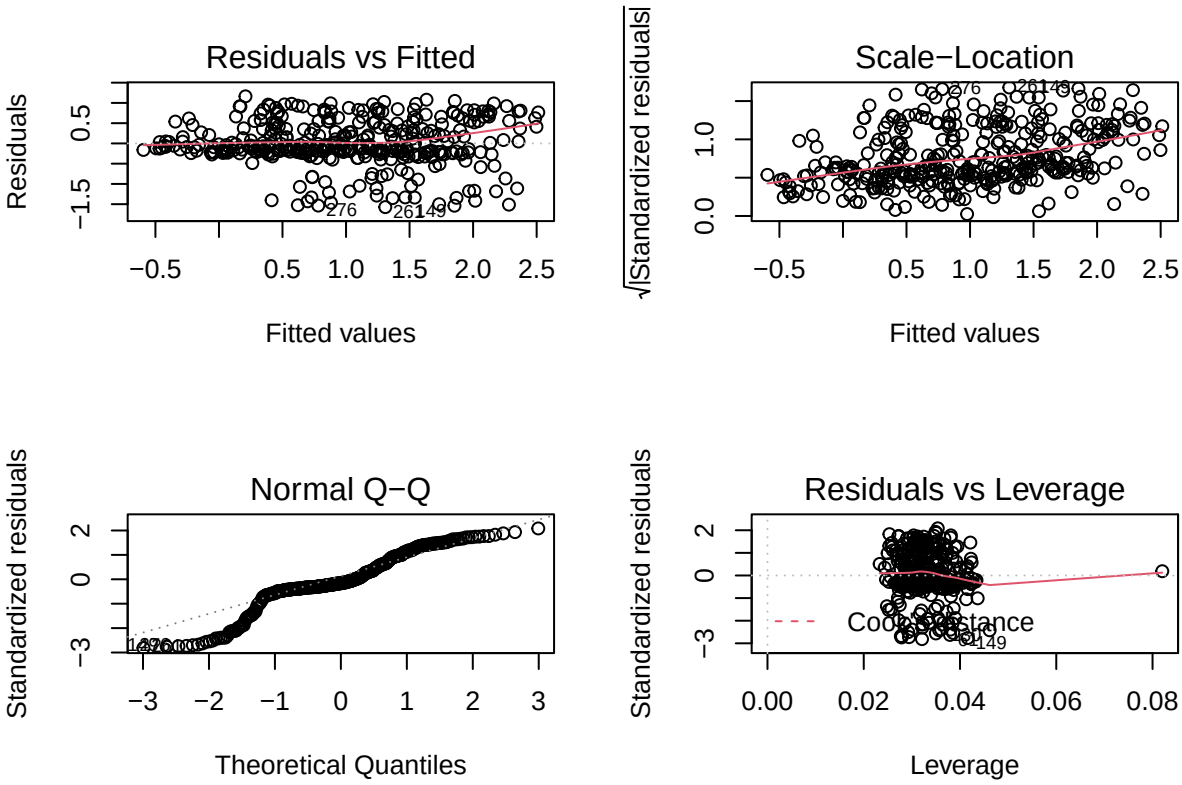
```
## x3          1   0.332   0.332   1.0274   0.31147
## x4          1  35.012  35.012 108.5038 < 2.2e-16 ***
## x5          1   0.033   0.033   0.1009   0.75094
## x6          1   0.005   0.005   0.0164   0.89812
## x7          1   1.430   1.430   4.4323   0.03598 *
## x8          1   0.090   0.090   0.2779   0.59843
## x9          1 118.737 118.737 367.9716 < 2.2e-16 ***
## x10         1   0.137   0.137   0.4260   0.51441
## x11         1   0.572   0.572   1.7725   0.18394
## Residuals 350 112.938   0.323
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
reg0 = lm(y ~ 1, data = data)
step(reg0, scope=y~x1 + x4 + x9, direction="forward")
```

```
## Start:  AIC=-75.66
## y ~ 1
##
##        Df Sum of Sq    RSS      AIC
## + x9    1   117.603 174.50 -260.152
## + x4    1    33.979 258.13 -118.426
## + x1    1    22.665 269.44 -102.897
## <none>              292.11  -75.659
##
## Step:  AIC=-260.15
## y ~ x9
##
##        Df Sum of Sq    RSS     AIC
## + x4    1    35.076 139.43 -339.38
## + x1    1    23.094 151.41 -309.54
## <none>              174.50 -260.15
##
## Step:  AIC=-339.38
## y ~ x9 + x4
##
##        Df Sum of Sq    RSS     AIC
## + x1    1    24.387 115.04 -406.98
## <none>              139.43 -339.38
##
## Step:  AIC=-406.98
## y ~ x9 + x4 + x1
```

```
##
## Call:
## lm(formula = y ~ x9 + x4 + x1, data = data)
##
## Coefficients:
## (Intercept)           x9           x4           x1
##      0.9764      -1.9820       1.1059       0.9103
```

```
par(mfcol=c(2,2))
plot(regm)
```




```
regp= lm(y ~ x1 + + x4 + x9 + I(x1^2) + I(x1^3) + I(x4^2) + I(x4^3) + I(x9^2) + I(x9^3), data=data)
summary(regp)
```

```
##
## Call:
## lm(formula = y ~ x1 + +x4 + x9 + I(x1^2) + I(x1^3) + I(x4^2) +
##     I(x4^3) + I(x9^2) + I(x9^3), data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.45996 -0.17845  0.00861  0.17537  0.45800
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.47730    0.07527  19.627  < 2e-16 ***
## x1           -7.56108    0.38757 -19.509  < 2e-16 ***
## x4            1.29274    0.39202   3.298  0.00107 **
## x9           -2.15353    0.39066  -5.513 6.85e-08 ***
## I(x1^2)      27.96632    0.90137  31.027  < 2e-16 ***
## I(x1^3)     -21.73094    0.59407 -36.580  < 2e-16 ***
## I(x4^2)      -1.20594    0.90427  -1.334  0.18320
## I(x4^3)       0.78261    0.59199   1.322  0.18703
## I(x9^2)       0.11168    0.90325   0.124  0.90167
## I(x9^3)      -0.02936    0.59085  -0.050  0.96039
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2095 on 352 degrees of freedom
## Multiple R-squared:  0.9471, Adjusted R-squared:  0.9457
```

```
## F-statistic:   700 on 9 and 352 DF,  p-value: < 2.2e-16
```

```
anova(regp)
```

```
## Analysis of Variance Table
##
## Response: y
##            Df  Sum Sq Mean Sq   F value Pr(>F)
## x1          1  22.665  22.665  516.1749 <2e-16 ***
## x4          1  35.237  35.237  802.4967 <2e-16 ***
## x9          1 119.163 119.163 2713.8384 <2e-16 ***
## I(x1^2)     1  40.360  40.360  919.1594 <2e-16 ***
## I(x1^3)     1  59.140  59.140 1346.8553 <2e-16 ***
## I(x4^2)     1   0.002   0.002    0.0422 0.8373
## I(x4^3)     1   0.073   0.073    1.6723 0.1968
## I(x9^2)     1   0.009   0.009    0.2058 0.6504
## I(x9^3)     1   0.000   0.000    0.0025 0.9604
## Residuals 352  15.456   0.044
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
regp= lm(y ~ x1 + + x4 + x9 + I(x1^2) + I(x1^3) + I(x4^2) + I(x4^3) + I(x9^2) + I(x9^3), data=data)
summary(regp)
```

```
##
## Call:
## lm(formula = y ~ x1 + +x4 + x9 + I(x1^2) + I(x1^3) + I(x4^2) +
##     I(x4^3) + I(x9^2) + I(x9^3), data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.45996 -0.17845  0.00861  0.17537  0.45800
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.47730    0.07527  19.627  < 2e-16 ***
## x1           -7.56108    0.38757 -19.509  < 2e-16 ***
## x4            1.29274    0.39202   3.298  0.00107 **
## x9           -2.15353    0.39066  -5.513 6.85e-08 ***
## I(x1^2)      27.96632    0.90137  31.027  < 2e-16 ***
## I(x1^3)     -21.73094    0.59407 -36.580  < 2e-16 ***
## I(x4^2)      -1.20594    0.90427  -1.334  0.18320
## I(x4^3)       0.78261    0.59199   1.322  0.18703
## I(x9^2)       0.11168    0.90325   0.124  0.90167
## I(x9^3)      -0.02936    0.59085  -0.050  0.96039
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2095 on 352 degrees of freedom
## Multiple R-squared:  0.9471, Adjusted R-squared:  0.9457
## F-statistic:   700 on 9 and 352 DF,  p-value: < 2.2e-16
```

```
anova(regp)
```

```
## Analysis of Variance Table
##
```

```
## Response: y
##             Df  Sum Sq Mean Sq   F value Pr(>F)
## x1           1  22.665  22.665  516.1749 <2e-16 ***
## x4           1  35.237  35.237  802.4967 <2e-16 ***
## x9           1 119.163 119.163 2713.8384 <2e-16 ***
## I(x1^2)      1  40.360  40.360  919.1594 <2e-16 ***
## I(x1^3)      1  59.140  59.140 1346.8553 <2e-16 ***
## I(x4^2)      1   0.002   0.002    0.0422 0.8373
## I(x4^3)      1   0.073   0.073    1.6723 0.1968
## I(x9^2)      1   0.009   0.009    0.2058 0.6504
## I(x9^3)      1   0.000   0.000    0.0025 0.9604
## Residuals 352  15.456   0.044
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
regp <- lm(y ~ poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree=2), data=data)
summary(regp)
```

```
##
## Call:
## lm(formula = y ~ poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10,
##     x11, degree = 2), data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.01456 -0.29544 -0.01561  0.30496  1.03387
##
## Coefficients:
##                                                                                    Estimate
## (Intercept)                                                                         0.98649
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0   4.87990
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)2.0.0.0.0.0.0.0.0.0  -6.16511
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0   0.23943
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.1.0.0.0.0.0.0.0.0  -2.78819
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.2.0.0.0.0.0.0.0.0   0.99150
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0  -0.20880
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.1.0.0.0.0.0.0.0  -9.89260
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.1.0.0.0.0.0.0.0  20.14546
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.2.0.0.0.0.0.0.0  -0.28066
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0   5.54408
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.1.0.0.0.0.0.0  16.76243
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.1.0.0.0.0.0.0   7.55423
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.1.0.0.0.0.0.0  11.36022
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.2.0.0.0.0.0.0  -0.03480
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0  -0.13639
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.1.0.0.0.0.0   1.06875
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.1.0.0.0.0.0   7.08993
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.1.0.0.0.0.0  -2.42179
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.1.0.0.0.0.0  -0.65281
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.2.0.0.0.0.0  -0.30043
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0   0.27326
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.1.0.0.0.0  10.21152
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.1.0.0.0.0   7.18841
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.1.0.0.0.0  24.10929
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.1.0.0.0.0  14.42362
```

```
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.1.0.0.0.0.0   1.48262
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.2.0.0.0.0.0   0.51949
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.0  -0.62111
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.1.0.0.0.0 -12.71512
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.1.0.0.0.0  12.66538
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.1.0.0.0.0  14.67769
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.1.0.0.0.0  -8.13773
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.1.0.0.0.0  -6.64308
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.1.0.0.0.0  -3.19137
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.2.0.0.0.0  -0.24706
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.0   0.58297
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.1.0.0.0   2.63105
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.1.0.0.0   6.05700
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.1.0.0.0   1.69774
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.1.0.0.0   1.19618
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.1.0.0.0  15.37382
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.1.0.0.0 -21.87770
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.1.0.0.0  -3.51886
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.2.0.0.0  -0.40067
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.0 -11.36285
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.1.0.0   3.85372
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.1.0.0  17.16935
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.1.0.0  -1.28596
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.1.0.0   1.79592
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.1.0.0   7.01650
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.1.0.0  -5.55049
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.1.0.0   3.44878
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.1.0.0 -20.75330
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.2.0.0   0.85362
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.0  -0.12201
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.1.0  -1.19053
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.1.0  27.28918
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.1.0  -1.91329
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.1.0 -10.22800
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.1.0 -12.25425
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.1.0 -20.29943
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.1.0 -11.73771
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.1.0   9.92804
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.1.0  -5.32493
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.2.0  -0.28288
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.1   1.05486
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.1   5.77406
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.1 -15.28759
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.1 -10.31006
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.1   2.45658
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.1  12.45661
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.1   1.87903
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.1   8.92079
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.1   7.39453
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.1  -6.88100
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.1   2.41675
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.2  -0.94091
##                                                                                      Std. Error
## (Intercept)                                                                            0.02436
```

```
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0    0.47797
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)2.0.0.0.0.0.0.0.0.0    0.53423
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0    0.49536
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.1.0.0.0.0.0.0.0.0    9.39685
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.2.0.0.0.0.0.0.0.0    0.52596
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0    0.48082
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.1.0.0.0.0.0.0.0    9.35599
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.1.0.0.0.0.0.0.0    9.33294
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.2.0.0.0.0.0.0.0    0.51809
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0    0.48908
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.1.0.0.0.0.0.0    9.79360
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.1.0.0.0.0.0.0   10.01916
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.1.0.0.0.0.0.0    9.57260
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.2.0.0.0.0.0.0    0.53079
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0    0.48884
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.1.0.0.0.0.0    9.98254
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.1.0.0.0.0.0    9.64293
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.1.0.0.0.0.0    9.56155
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.1.0.0.0.0.0    9.32919
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.2.0.0.0.0.0    0.53457
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0    0.48828
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.1.0.0.0.0    9.70602
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.1.0.0.0.0    9.81537
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.1.0.0.0.0   10.05325
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.1.0.0.0.0   10.06667
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.1.0.0.0.0    9.50256
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.2.0.0.0.0    0.54209
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0    0.48708
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.1.0.0.0   10.11520
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.1.0.0.0    9.76943
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.1.0.0.0    9.98818
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.1.0.0.0   10.19041
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.1.0.0.0    9.26364
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.1.0.0.0    9.94543
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.2.0.0.0    0.52002
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0    0.48394
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.1.0.0    9.81861
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.1.0.0    9.70316
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.1.0.0    9.65219
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.1.0.0    9.18933
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.1.0.0   10.18218
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.1.0.0    9.82870
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.1.0.0    9.60058
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.2.0.0    0.53210
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0    0.48378
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.1.0    9.55052
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.1.0    9.96949
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.1.0    9.54509
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.1.0    9.71960
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.1.0   10.12280
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.1.0    9.65960
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.1.0    9.87370
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.1.0    9.65788
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.2.0    0.54926
```

```
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.0    0.48747
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.1.0    9.81039
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.1.0    9.78909
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.1.0   10.14468
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.1.0   10.12550
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.1.0    9.60108
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.1.0    9.82683
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.1.0    9.56575
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.1.0    9.95940
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.1.0    8.88171
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.2.0    0.53017
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.1    0.49209
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.1   10.04916
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.1    9.60453
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.1    9.74388
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.1    9.56190
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.1   10.18356
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.1    9.78969
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.1    9.99974
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.1    9.78578
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.1    9.90414
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.1    9.68004
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.2    0.53496
##                                                                                        t value
## (Intercept)                                                                             40.500
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.0    10.210
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)2.0.0.0.0.0.0.0.0.0.0   -11.540
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.0     0.483
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.1.0.0.0.0.0.0.0.0.0    -0.297
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.2.0.0.0.0.0.0.0.0.0     1.885
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.0    -0.434
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.1.0.0.0.0.0.0.0.0    -1.057
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.1.0.0.0.0.0.0.0.0     2.159
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.2.0.0.0.0.0.0.0.0    -0.542
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.0    11.336
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.1.0.0.0.0.0.0.0     1.712
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.1.0.0.0.0.0.0.0     0.754
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.1.0.0.0.0.0.0.0     1.187
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.2.0.0.0.0.0.0.0    -0.066
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.0    -0.279
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.1.0.0.0.0.0.0     0.107
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.1.0.0.0.0.0.0     0.735
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.1.0.0.0.0.0.0    -0.253
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.1.0.0.0.0.0.0    -0.070
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.2.0.0.0.0.0.0    -0.562
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.0     0.560
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.1.0.0.0.0.0     1.052
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.1.0.0.0.0.0     0.732
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.1.0.0.0.0.0     2.398
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.1.0.0.0.0.0     1.433
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.1.0.0.0.0.0     0.156
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.2.0.0.0.0.0     0.958
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.0    -1.275
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.1.0.0.0.0    -1.257
```

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## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.1.0.0.0.0   1.296
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.1.0.0.0.0   1.470
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.1.0.0.0.0  -0.799
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.1.0.0.0.0  -0.717
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.1.0.0.0.0  -0.321
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.2.0.0.0.0  -0.475
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.0   1.205
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.1.0.0.0   0.268
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.1.0.0.0   0.624
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.1.0.0.0   0.176
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.1.0.0.0   0.130
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.1.0.0.0   1.510
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.1.0.0.0  -2.226
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.1.0.0.0  -0.367
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.2.0.0.0  -0.753
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.0 -23.488
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.1.0.0   0.404
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.1.0.0   1.722
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.1.0.0  -0.135
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.1.0.0   0.185
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.1.0.0   0.693
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.1.0.0  -0.575
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.1.0.0   0.349
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.1.0.0  -2.149
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.2.0.0   1.554
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.0  -0.250
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.1.0  -0.121
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.1.0   2.788
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.1.0  -0.189
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.1.0  -1.010
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.1.0  -1.276
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.1.0  -2.066
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.1.0  -1.227
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.1.0   0.997
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.1.0  -0.600
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.2.0  -0.534
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.1   2.144
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.1   0.575
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.1  -1.592
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.1  -1.058
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.1   0.257
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.1   1.223
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.1   0.192
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.1   0.892
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.1   0.756
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.1  -0.695
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.1   0.250
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.2  -1.759
##                                                                                     Pr(>|t|)
## (Intercept)                                                                          < 2e-16
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.0  < 2e-16
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)2.0.0.0.0.0.0.0.0.0.0  < 2e-16
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.0  0.62922
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.1.0.0.0.0.0.0.0.0.0  0.76690
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## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.2.0.0.0.0.0.0.0.0  0.06044
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0  0.66443
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.1.0.0.0.0.0.0.0  0.29125
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.1.0.0.0.0.0.0.0  0.03172
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.2.0.0.0.0.0.0.0  0.58843
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0  < 2e-16
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.1.0.0.0.0.0.0  0.08807
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.1.0.0.0.0.0.0  0.45149
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.1.0.0.0.0.0.0  0.23632
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.2.0.0.0.0.0.0  0.94778
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0  0.78044
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.1.0.0.0.0.0  0.91482
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.1.0.0.0.0.0  0.46280
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.1.0.0.0.0.0  0.80023
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.1.0.0.0.0.0  0.94426
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.2.0.0.0.0.0  0.57456
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0  0.57617
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.1.0.0.0.0  0.29366
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.1.0.0.0.0  0.46455
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.1.0.0.0.0  0.01712
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.1.0.0.0.0  0.15301
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.1.0.0.0.0  0.87613
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.2.0.0.0.0  0.33872
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0  0.20329
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.1.0.0.0  0.20978
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.1.0.0.0  0.19588
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.1.0.0.0  0.14280
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.1.0.0.0  0.42521
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.1.0.0.0  0.47389
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.1.0.0.0  0.74853
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.2.0.0.0  0.63508
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0  0.22935
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.1.0.0  0.78892
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.1.0.0  0.53298
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.1.0.0  0.86050
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.1.0.0  0.89652
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.1.0.0  0.13219
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.1.0.0  0.02681
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.1.0.0  0.71425
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.2.0.0  0.45207
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0  < 2e-16
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.1.0  0.68688
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.1.0  0.08612
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.1.0  0.89293
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.1.0  0.85354
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.1.0  0.48879
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.1.0  0.56601
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.1.0  0.72713
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.1.0  0.03249
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.2.0  0.12127
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1  0.80255
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.1  0.90350
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.1  0.00567
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.1  0.85054
```

```
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.1.0  0.31330
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.1.0  0.20288
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.1.0  0.03976
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.1.0  0.22082
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.1.0  0.31969
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.1.0  0.54929
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.2  0.59406
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.1  0.03291
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.1  0.56603
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.1  0.11256
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.1  0.29091
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.1  0.79743
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.1  0.22227
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.1  0.84793
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.1  0.37309
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.1  0.45049
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.1  0.48777
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.1  0.80303
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.2  0.07968
##
## (Intercept)                                                                        ***
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.0 ***
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)2.0.0.0.0.0.0.0.0.0.0 ***
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.1.0.0.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.2.0.0.0.0.0.0.0.0.0 .
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.1.0.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.1.0.0.0.0.0.0.0.0 *
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.2.0.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.0 ***
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.1.0.0.0.0.0.0.0 .
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.1.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.1.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.2.0.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.1.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.1.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.1.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.1.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.2.0.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.1.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.1.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.1.0.0.0.0.0 *
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.1.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.1.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.2.0.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.1.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.1.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.1.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.1.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.1.0.0.0.0
```

```
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.1.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.2.0.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.1.0.0.0 *
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.1.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.2.0.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.0 ***
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.1.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.1.0.0 .
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.1.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.1.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.1.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.1.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.1.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.1.0.0 *
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.2.0.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.1.0 **
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.1.0 *
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.1.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.2.0
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.1 *
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)1.0.0.0.0.0.0.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.1.0.0.0.0.0.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.1.0.0.0.0.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.1.0.0.0.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.1.0.0.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.1.0.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.1.0.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.1.0.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.1.0.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.1.1
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)0.0.0.0.0.0.0.0.0.0.2 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4493 on 284 degrees of freedom
## Multiple R-squared:  0.8038, Adjusted R-squared:  0.7506
## F-statistic: 15.11 on 77 and 284 DF,  p-value: < 2.2e-16
```

```
anova(regp)
```

```
## Analysis of Variance Table
##
```

```
## Response: y
##                                                                  Df  Sum Sq
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2)  77 234.786
## Residuals                                                       284  57.319
##                                                                 Mean Sq F value
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2) 3.04918  15.108
## Residuals                                                       0.20183
##                                                                    Pr(>F)
## poly(x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, degree = 2) < 2.2e-16 ***
## Residuals
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
reg0 = lm(y ~ 1, data = data)
step(reg0, scope=y~x1 + x4 + x9 + I(x1^2) + I(x1^3), direction="forward")
```

```
## Start:  AIC=-75.66
## y ~ 1
##
##           Df Sum of Sq    RSS      AIC
## + x9       1   117.603 174.50 -260.152
## + x4       1    33.979 258.13 -118.426
## + x1       1    22.665 269.44 -102.897
## + I(x1^2)  1    10.104 282.00  -86.403
## + I(x1^3)  1     2.265 289.84  -76.478
## <none>                292.11  -75.659
##
## Step:  AIC=-260.15
## y ~ x9
##
##           Df Sum of Sq    RSS     AIC
## + x4       1    35.076 139.43 -339.38
## + x1       1    23.094 151.41 -309.54
## + I(x1^2)  1     8.683 165.82 -276.63
## + I(x1^3)  1     1.268 173.24 -260.79
## <none>                174.50 -260.15
##
## Step:  AIC=-339.38
## y ~ x9 + x4
##
##           Df Sum of Sq    RSS     AIC
## + x1       1   24.3870 115.04 -406.98
## + I(x1^2)  1   10.2179 129.21 -364.94
## + I(x1^3)  1    2.2532 137.17 -343.28
## <none>                139.43 -339.38
##
## Step:  AIC=-406.98
## y ~ x9 + x4 + x1
##
##           Df Sum of Sq     RSS     AIC
## + I(x1^3)  1    57.031  58.009 -652.84
## + I(x1^2)  1    40.360  74.680 -561.39
## <none>                115.040 -406.98
##
## Step:  AIC=-652.84
```

```
## y ~ x9 + x4 + x1 + I(x1^3)
##
##           Df Sum of Sq    RSS      AIC
## + I(x1^2)  1    42.468 15.541 -1127.64
## <none>                 58.009  -652.84
##
## Step:  AIC=-1127.64
## y ~ x9 + x4 + x1 + I(x1^3) + I(x1^2)
```

```
##
## Call:
## lm(formula = y ~ x9 + x4 + x1 + I(x1^3) + I(x1^2), data = data)
##
## Coefficients:
## (Intercept)           x9           x4           x1      I(x1^3)      I(x1^2)
##       1.507       -2.067        0.790       -7.545      -21.691       27.919
```

```
s <- optimumLHS(90,3)
s
```

```
##              [,1]       [,2]        [,3]
##  [1,] 0.234738054 0.66783868 0.069263761
##  [2,] 0.841843798 0.41564743 0.142108942
##  [3,] 0.913918739 0.76750233 0.569960365
##  [4,] 0.543228862 0.53860389 0.985627994
##  [5,] 0.973049314 0.16775265 0.466118400
##  [6,] 0.208980891 0.58120461 0.199124897
##  [7,] 0.459949200 0.59994824 0.512740093
##  [8,] 0.789521847 0.11470235 0.875684020
##  [9,] 0.427940440 0.61549189 0.048105179
## [10,] 0.005692299 0.31727097 0.994551994
## [11,] 0.165047935 0.69912990 0.859727781
## [12,] 0.335230797 0.45044722 0.560812510
## [13,] 0.747792473 0.32542071 0.272662371
## [14,] 0.981119556 0.29631743 0.114219583
## [15,] 0.155290155 0.64000729 0.363544761
## [16,] 0.190252488 0.63298017 0.758224414
## [17,] 0.644222532 0.22624243 0.087726501
## [18,] 0.762308531 0.12866278 0.629933784
## [19,] 0.709266781 0.18379017 0.066624973
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## [22,] 0.318248660 0.71433615 0.407919050
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## [25,] 0.720288206 0.74006825 0.813618279
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## [89,] 0.211998106 0.27247237 0.038914749
## [90,] 0.301581317 0.76150214 0.483301609
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