R입문 기말고사

함소희(202115829)

12/21/2021

1번-(1)

```r
epsilon=rnorm(1000)
epsilon
```

```
##    [1]  1.0090897433  0.3607756069  0.4220873626  0.6292642151 -0.6841013471
##    [6] -0.7070490139 -1.9218140415 -0.9440446214 -0.1990970183  1.2963212195
##   [11]  2.5317734613  0.8474583783  0.9038361492 -1.2247756668  1.7888072059
##   [16] -0.0726054660 -0.9281657393 -1.7998100394 -0.3520286622  0.7986498065
##   [21] -1.1099718421  0.0309857708  1.0123792428 -0.0269046925  0.6266185980
##   [26] -3.3751027329 -1.0469107354  1.8184465469  2.0710401148  0.7349157757
##   [31]  1.4031372184 -0.1934811911  0.6653602237 -1.4371055362  0.5207805217
##   [36]  0.8767576873  0.2262114967  0.5732951984 -1.6309573410 -1.2865136050
##   [41] -0.2719240579  2.0398961589 -1.7900042116  0.6587052611  0.6966675976
##   [46]  1.5077651152  0.7135774565 -1.5001288902 -0.7644069338  0.7121927443
##   [51] -0.2617443810  1.1660176835 -0.6235692727  1.0915189644  0.4676180908
##   [56]  0.1440035534  1.0581761880  0.9775789288  0.8190399184 -2.2593595768
##   [61] -1.0304673339  2.3747350233  0.6809807351 -0.8618744564 -0.8969409828
##   [66]  0.4231415902  0.6478613182  1.0468054990  0.9006084046  0.7000396703
##   [71] -0.4949208289 -0.2601831195 -0.5082387309  0.2382698907 -2.3186916356
##   [76] -1.4924824878 -1.2486516112 -0.0005070864 -0.0595453807  0.8148619740
##   [81] -0.5373236634 -1.3545302884 -1.3646916048  0.2010194215 -1.7227370416
##   [86]  0.4946120804  1.8338129183  0.3075465407 -1.1751479904  0.6649025174
##   [91] -0.2137082015  0.7114540048  0.1095413770 -0.8424025230  0.2625460540
##   [96]  1.0727883660  0.3770254573  0.5921240236 -0.3003614090 -1.6171167423
##  [101] -2.0267895717  0.3256235318  0.4119582356  0.4394115571  0.3221870858
##  [106] -0.6377081716  0.6508436675 -0.8365975688 -0.5315974802 -1.3911223300
##  [111]  0.1941608464 -0.8137420018  0.3371933610  0.5002233381  0.8194883637
##  [116]  1.8162522791 -1.0298023580 -0.1842296134 -1.7145531745 -0.0808761734
##  [121]  0.7755361724  0.5772845785 -1.6629291788 -1.3658907157 -0.7939524367
##  [126]  0.2387074245 -1.0683027665 -0.8733149687 -1.1319902019 -0.2458102031
##  [131]  1.1816347850  1.4610676511 -1.2435463431  0.4403583041  0.0439441475
##  [136]  0.7571992416  0.6126947604 -0.4503263565 -0.5385639752 -0.0279400276
```

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## [141]  0.9926605080 -1.9333400276 -0.0679800433 -0.1967531674  1.4365438858
## [146]  1.4574125394  1.6108303905 -1.2791468714  0.1979794186  2.0686179350
## [151]  0.2043986557 -2.2360815442 -1.4391171534 -0.6979554438 -1.4943755388
## [156] -0.5827568640 -0.5016867577  0.3887177082 -1.4830306915 -0.0264013839
## [161]  2.4751863970 -2.8115317402 -0.6591305062  1.0305277990  0.3731454068
## [166]  0.2270224341  0.9926151206  1.8173797512  0.5190167817 -0.7270180346
## [171]  2.5503822755  0.3963391337 -0.1740243259  0.5674703071  0.9891452084
## [176]  1.8238754452  0.5139795082  0.4081445158  0.7234621592  0.9145637233
## [181]  2.1914916755 -0.3485011131  1.1271800550  0.4149051704 -2.7035096747
## [186]  1.0693925976  0.8524181449  0.1543613561  0.7021429203 -0.0351516716
## [191] -2.6191704457 -1.0610997706  0.0956798271 -0.2902480981  2.4364331509
## [196] -0.1126674041  0.1229517727 -0.0839766856  2.2706309249  0.5149715665
## [201]  1.2667583267 -0.1083278675 -0.1511453309 -0.0102799955  0.3739296719
## [206] -0.5126407363  1.0989621983 -1.9081198635  0.5164246585  0.1153736368
## [211] -1.7426909174 -0.6624078862 -0.2194507876 -0.2585369154 -1.2104860966
## [216]  0.6394698431  0.2163666016  0.1642460836  0.6565218316 -1.1835300031
## [221]  0.3775349835  1.0003051299  0.1387233338 -0.5247701363 -0.6549869925
## [226] -1.9650828107 -0.0798144532  1.5541369349 -1.2087666749  0.4848489745
## [231] -0.2067538560 -1.3038572413  0.4049342657 -0.3076429257  0.5042715915
## [236] -0.2028713871  0.5040045563  0.9712769449 -1.3063258758 -0.3387615921
## [241]  0.1399083584 -0.6777188831 -1.2094849511 -0.2874435042  2.6883759240
## [246] -1.2098278090  1.3981369318 -2.8911979137  0.7858458461 -0.4070148416
## [251]  2.4268857323 -1.2399518511  0.1960649339  0.3540220848 -1.8216629915
## [256]  0.5403141092 -0.3032350443 -1.4331353818 -0.0835535079  0.6063592733
## [261] -0.2108282312 -1.0381089527 -1.2237773491  0.2264217318  1.3350107589
## [266] -1.3769058681  2.1221819939 -0.9147917270  0.8921033614  1.1984972723
## [271]  0.5459073877  1.8975658405 -1.6232830603 -1.5504128923  0.1743705878
## [276]  1.1632500651  0.9587317733  1.9061595185  1.8539963152  1.0553954235
## [281]  0.0136069140  0.6571590211  0.3547553322 -1.4075591453 -0.6982858873
## [286] -0.1173125152  0.8495716431  0.8951340750  0.9056322265 -1.9605327560
## [291] -1.0758822773 -0.3645289644 -0.3566691224 -1.3389575764 -0.7117657796
## [296] -0.2776294426  1.2263279750 -1.2141710339 -0.4685751338  0.5101796263
## [301] -0.8297160959 -1.6390427887  1.8044639409 -2.0834599373  0.7872800651
## [306]  1.2129012932 -0.6956148885 -1.0160238062  1.4593891257 -0.3535094178
## [311] -1.4592907019  1.0592484571  1.5074630915 -0.8029879296 -2.1304232570
## [316] -0.0555306891 -1.0059458515  0.4280715276  0.2420425701 -0.5833014429
## [321]  0.7165473851  1.2015699829 -0.6691403775  0.2098132539 -1.7223678687
## [326]  0.0693709324 -1.0670678006 -1.9005533875 -0.2486691110 -0.3072215846
## [331]  0.8707079381  0.6378863235 -0.5750071180  0.5365398746  1.1947943466
## [336] -0.5136659714  1.1961424854 -1.2074378357  1.0395595879  1.4883613876
## [341]  0.7586754597 -0.9385892623 -0.4723297491  0.1934466028  1.1309596678
## [346] -0.6988732738  0.5767973460 -0.3765542919 -1.7619552817  1.6647854096
## [351]  0.0586761795  1.8221527009  0.5215078151 -0.0635387993  0.2430450686
## [356]  0.0792724568  1.2312530110  0.1203801885 -1.3365209866  0.7621034434
## [361]  1.4141789241 -0.2892610435  1.0290428136 -0.0953818916 -1.3860241912
```

```
## [366]  0.1446154741  0.8883369227  1.1083657103  2.5516387688 -0.0240846202
## [371] -0.2149934811 -0.7965993530 -0.0047433828  0.1355536687  1.2215836945
## [376]  1.1341485924 -1.1401488575 -1.9705213992  1.3718820480  1.5954788255
## [381]  0.8946970673 -0.0286941640  2.0865343655 -0.5313371114 -1.9739172577
## [386]  0.8365162382  1.1906089889 -1.2374324326  0.0921064388  1.8586108500
## [391] -0.6336909024  0.0043758138 -0.0717596651  1.2962469307 -1.8994630663
## [396]  0.9427106611  0.4281702544  0.7987143218  1.4005547426 -0.1709353732
## [401]  0.2863703782 -0.4771277072 -0.9179835486 -1.7238965613 -0.0752650959
## [406] -0.5417382733  1.6780490648  3.1091484989  1.2430763812 -0.6614661582
## [411]  0.4717861162  1.6055926969 -0.5275288055  0.2251514975 -1.2208035582
## [416]  0.4357300496 -0.2276923630 -1.8100981170 -0.2782659719  1.6458771723
## [421]  0.1374905717  0.2370214394  0.4343666107  0.4586480595 -0.1619813778
## [426] -1.6290022815  0.3924775847  0.7346245657 -0.1999846112  1.3559092673
## [431] -0.4710889736  0.6295691748 -0.2746340107 -0.5157881847  0.4971649741
## [436] -0.1183128284  0.3783018693 -1.7290641365  2.4369635372 -0.1253172852
## [441]  2.2015233308 -0.9047117444  0.0916355415  1.1677830176  0.9370869377
## [446] -0.2373181455  0.2034812399 -0.7293280843 -0.1771584207  0.4726794492
## [451] -1.2412950308 -1.5078255731  1.1690090098  0.6151797453  0.5905295987
## [456]  1.3950283179 -0.8724462746  0.1618086642  0.5432570925  0.3923916334
## [461]  1.1750690230 -0.4135329506  0.0512639944  0.2905092907 -0.2872660859
## [466]  1.3928033736 -0.5618627480 -0.9116106216  1.2755633909 -0.2387878486
## [471] -0.5188418141 -1.0129663874 -0.8026039756 -0.9710323875  0.0739850691
## [476]  1.7573501331 -0.6297760715 -1.5157473885  0.9312111343 -0.5665311194
## [481] -0.4613366927  1.2513628425  0.6133543467  0.0582600100  0.7583533035
## [486]  0.2370822263 -0.2502557563 -0.3369596366 -0.9938864626  1.1324657069
## [491] -0.4039453134 -1.6572360723  0.0376036050  1.3130052316  1.2803790402
## [496] -0.9033120476  0.2396080244 -1.3572685680 -0.2750702674  0.2499392251
## [501] -0.2621206631 -1.2886801098 -0.7729051535 -1.8412909454 -1.2455021441
## [506]  0.0824641273  1.3515901860 -0.0242359091  0.3557074873 -0.5862087214
## [511] -0.2929393269  0.4327690037 -0.1511626935  0.2859091584  0.4693749252
## [516] -0.3254696188 -0.4110605080 -1.6820648347  1.7509646889  1.4121560862
## [521] -0.2121517763  0.4982783372 -0.0499428766  0.8091998418 -1.2511342055
## [526]  1.3751856367  0.9089595876  0.5857310244  0.0207467351 -1.2955614542
## [531]  1.7038116070  0.6337892729  0.6044830658 -1.2654928822  1.2329057428
## [536]  2.1490145947 -1.3035900232 -0.7962147831 -0.1416702392  0.2948438895
## [541] -1.2090174462 -1.1953246736  0.1349787951  1.0034725462 -0.5131523619
## [546]  0.3188623120 -0.6642578666 -0.0780488695 -0.7066535706  0.8109016713
## [551]  0.1945546488  0.5729652003 -0.7765084601 -1.4347706262 -1.2305955392
## [556] -1.0159669799 -0.8623780599 -0.3920850081  1.7929620935  1.2407182586
## [561]  0.7256219342 -0.3020510669  0.4872933673 -0.9406206439  0.5704602900
## [566]  0.4458387078  0.3434404445 -1.4488236345  1.0556270065  1.0524971948
## [571] -1.7630291244  0.7049316915  0.0711334480 -0.3848991517 -1.4963679369
## [576]  0.5801474535 -0.4047091906 -1.1057404083  0.8048385555 -0.5188786208
## [581] -0.8152587165  1.4676796028  0.1541768333 -2.2884285875  0.7105809355
## [586] -1.3419895292  0.8351576201 -0.6349983496 -0.0045764341  0.5282873245
```

```
## [591]   0.9405248961 -0.1781719946   0.2544535968   0.2846989272   2.7164053267
## [596]   0.0625789064   0.6588573190   0.5736723842 -1.8456752934   0.2683391446
## [601]   0.4572926038   0.6646539521   1.1178613642   1.0802425444 -1.4569794927
## [606]   2.4337898097   2.1568485098 -1.1532391630   1.0746321430 -0.7073086314
## [611] -1.7334042009 -0.8001795910 -1.5046261367   0.4947428763 -0.2076880808
## [616]   1.1821631896 -0.0476773346 -0.8949575564 -0.8897457934 -0.9163442715
## [621] -2.6534746403 -0.4272783299 -1.1027912165   1.5991335116   0.6214298884
## [626] -0.3914051101   1.9040820781   0.2501568435   0.7318044378   0.2918901274
## [631] -1.3120868673 -0.4091456815   0.9604486012 -1.0439050722 -1.5362296722
## [636]   0.0563974704   0.2579455879 -0.4994725038   2.0240529996 -0.2674706049
## [641] -1.2231649251   0.5036265672   0.0972529456 -0.4700335657 -1.0280850105
## [646] -0.9089676956   1.3533023754   0.5699582802   0.2294665780   1.7465899783
## [651] -1.7724927476   1.0044969648 -0.6740181111 -0.7188407896 -0.1877643085
## [656] -0.2614335157   0.4758794851 -1.5845191890   0.3836603407 -1.5204100142
## [661]   0.2857941485   0.0841618157   1.5746926904 -0.7862621780 -0.0783711221
## [666]   1.0663775880 -1.0972918947   0.8028427704 -1.3207910908 -0.7359240059
## [671] -0.9469339513   0.1310322111   0.8434533552   1.4465418163   0.6787532371
## [676]   1.0912858319 -2.3577736996   0.1353994125   0.4863323916 -0.2563306160
## [681]   1.8004072611 -0.1147498624   0.3048038326 -0.9252473833 -0.7062190975
## [686] -1.1622576963 -1.7473084819 -0.0696642407 -0.7151374683   0.8179220212
## [691] -1.7953564090 -0.5857526694   0.6461528640   0.6727599701   0.4200338159
## [696]   2.0102344150 -2.0676795484 -0.7162916616   0.4573029063 -1.1877455149
## [701]   0.7326552229 -2.1668415048 -1.5301297948   0.0435572837 -2.1203441811
## [706]   1.4557991975   0.2812352054 -0.3708813871   3.1133365730 -0.4044339020
## [711] -0.5050237804   0.0357328416   0.9641722153 -1.1896468503 -1.8186516575
## [716] -1.0879611872 -0.7125329451   2.0171940165   0.6963791969 -0.1946446073
## [721]   0.0401518309 -1.6435407040   0.2931064886 -0.0504248246 -1.4006344237
## [726] -0.7178882771 -0.7682552362   0.5756408310   0.1167509654 -1.0549669374
## [731]   0.6405752003 -0.7116292889   1.0696403036 -0.8186095888 -0.3354920571
## [736]   0.8779963434   0.6908486636 -1.2567975695 -1.0055268394   0.1603479807
## [741]   0.5369189739   2.4390102101 -1.1590276166   0.1086998748 -1.7051619448
## [746]   0.4044047759   1.4462508725   0.2640080692   0.1178351852   0.9899841883
## [751] -1.5527288029   0.0128994181   0.5967879474 -0.0529141754   0.7113607029
## [756] -0.8395986458 -1.3699219207   0.0281619514 -1.0960517780 -0.1623563341
## [761]   0.7924201860   1.0061142505   0.7098868390   0.3189592917 -0.5596701491
## [766] -0.9379837215 -0.4881029677   1.1778107681 -0.6924163063   0.9069314251
## [771] -1.4088016087   0.4849890487   0.0835047852 -0.6323652287 -0.5263230325
## [776]   0.7177061100   0.9616134975   2.1234384512 -0.1965553572   1.2215882076
## [781] -1.0836940148   0.9229973504 -1.5623491071 -0.7890689624 -1.3466975887
## [786] -0.4095673125   0.9320465126 -0.9074706761 -0.7679317502 -0.4991324314
## [791]   0.3438316214 -0.3449011374 -0.8645935301 -0.3236633761 -0.3750230805
## [796]   0.9976965390   1.2809973226 -2.3542641124   0.3200029711   0.0632457406
## [801] -0.2737675796   0.9500640890   0.6794244785   0.5743203579   1.8968828377
## [806] -0.1456667044 -1.5437337650   0.1277279269   1.7332975996 -1.0286163420
## [811]   1.0188862236   0.8011786613 -1.2494026128 -0.3432465650 -0.3283412017
```

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```
##   [816]  2.1853102002  1.3431305445  0.8595917653 -1.0305329910  0.0700394538
##   [821]  0.1442818671  0.2849367929  2.1442107073  0.4479110412  0.0721728875
##   [826] -1.1504984084  0.0476152014 -0.4490740596 -0.1386816962 -2.1678724126
##   [831]  0.3223855915 -1.5128707554 -1.0137561544  0.7132058309  0.2335179059
##   [836]  0.3686390193 -0.9581468691 -1.1563078558 -1.2278343485 -0.3033064313
##   [841] -0.0725853171  1.0310772743  0.0454126439 -2.3858026084  0.7380249880
##   [846] -1.0884189758 -0.2514972433  0.3576861274  0.1283701253 -1.7698228683
##   [851] -0.4275535877 -0.1518340149  0.1122358997 -0.7531422846  0.8035944737
##   [856]  0.6661843940  1.1267370728  0.1063791870  0.2314050812 -0.9739526861
##   [861]  1.6419967274  2.0892482567 -1.2979061282 -0.5912953339  1.7700335066
##   [866] -0.0263417618  0.2742524522 -0.7565610909  1.0140904567 -0.1062898081
##   [871]  0.6816646175 -0.6436813903 -0.6262568236 -1.4882717181 -0.3233240440
##   [876]  1.3827184334 -0.0632802536 -0.9313449491 -0.6015575250 -1.5963198527
##   [881]  2.2924510371  1.6864117918  1.6010717943 -0.7657296467 -1.2722760464
##   [886]  0.1906861801 -0.4650829828  0.5549204948  0.8287660487 -1.5060095460
##   [891]  0.3809658006  0.0682372952 -2.0641662924  0.9194726452  0.4291777116
##   [896] -1.7745368937  0.2339832785  0.8043828671  0.1157533517  1.5831444882
##   [901] -0.3607656626 -1.8495911616  0.9310556804 -0.0450780421 -1.6530247131
##   [906] -2.1603420379  1.4495858344  0.6567288554 -1.8162060848 -2.8459195778
##   [911]  1.3668015104 -0.5636923140  1.1459200926  1.6498753504 -0.0142475695
##   [916] -0.9842715524 -0.4431863498  0.7795340770 -0.1945632613  0.1016135889
##   [921] -0.0690729211  1.4530485312 -0.1020989003  0.6374179937  1.3331728023
##   [926] -0.2046888348  0.8356188304  0.3642504090 -1.1600499988 -0.4373481402
##   [931] -0.4947149774  1.1291112469  1.6396999116  1.3622957983  0.0016878439
##   [936]  0.7107590399  1.6446637567 -1.1482301416 -0.5417680713  1.0784364810
##   [941] -1.1340250533 -0.2570800896  0.6933276355  0.3732533499 -0.4001231944
##   [946]  0.6481221775 -1.0510119103 -1.4534794679  0.2433936360 -0.4839659612
##   [951]  0.2276094328  0.2918474756 -0.2134829870 -0.8184471628  0.8098008357
##   [956] -0.0426126497  0.8101471587  0.5137236267  1.0247278710 -1.1120701343
##   [961]  1.1614991016  1.9756835781  0.3198256883  0.0107986711 -0.1390444517
##   [966] -0.7274064473  0.0212282200 -0.0892569563  0.7036450432 -1.0618512304
##   [971] -0.9785210803  1.8323977151  3.0243358873  0.1009766650  0.9938828367
##   [976] -0.9184338505  0.1141985207 -2.9192558504  0.8434399330  2.4802608705
##   [981]  0.1372803467 -0.2629102954 -0.3427905059 -1.3555020802 -0.3770446817
##   [986]  0.3819872625 -1.0356387296  0.5185370715 -0.5507174910  1.3214755256
##   [991]  0.9782574002 -2.8242330424 -0.4402732061  0.6674802854 -0.5428529060
##   [996] -2.0014459315  1.6467337316  1.3724244171  2.0681355496  0.9168730923
```

##1번-(2)

```
i=1:1000
t_i=(2*pi*i)/1000
sin(t_i)
```

```
##    [1]  6.283144e-03  1.256604e-02  1.884844e-02  2.513010e-02  3.141076e-02
##    [6]  3.769018e-02  4.396812e-02  5.024432e-02  5.651853e-02  6.279052e-02
```

```
##   [11] 6.906003e-02 7.532681e-02 8.159061e-02 8.785120e-02 9.410831e-02
##   [16] 1.003617e-01 1.066112e-01 1.128564e-01 1.190972e-01 1.253332e-01
##   [21] 1.315644e-01 1.377903e-01 1.440108e-01 1.502256e-01 1.564345e-01
##   [26] 1.626372e-01 1.688334e-01 1.750231e-01 1.812058e-01 1.873813e-01
##   [31] 1.935495e-01 1.997100e-01 2.058626e-01 2.120071e-01 2.181432e-01
##   [36] 2.242708e-01 2.303894e-01 2.364990e-01 2.425992e-01 2.486899e-01
##   [41] 2.547707e-01 2.608415e-01 2.669020e-01 2.729519e-01 2.789911e-01
##   [46] 2.850193e-01 2.910362e-01 2.970416e-01 3.030353e-01 3.090170e-01
##   [51] 3.149865e-01 3.209436e-01 3.268880e-01 3.328195e-01 3.387379e-01
##   [56] 3.446429e-01 3.505343e-01 3.564119e-01 3.622754e-01 3.681246e-01
##   [61] 3.739592e-01 3.797791e-01 3.855840e-01 3.913737e-01 3.971479e-01
##   [66] 4.029064e-01 4.086491e-01 4.143756e-01 4.200857e-01 4.257793e-01
##   [71] 4.314560e-01 4.371158e-01 4.427582e-01 4.483832e-01 4.539905e-01
##   [76] 4.595799e-01 4.651511e-01 4.707039e-01 4.762382e-01 4.817537e-01
##   [81] 4.872501e-01 4.927273e-01 4.981851e-01 5.036232e-01 5.090414e-01
##   [86] 5.144395e-01 5.198173e-01 5.251746e-01 5.305112e-01 5.358268e-01
##   [91] 5.411213e-01 5.463943e-01 5.516459e-01 5.568756e-01 5.620834e-01
##   [96] 5.672689e-01 5.724321e-01 5.775727e-01 5.826905e-01 5.877853e-01
##  [101] 5.928568e-01 5.979050e-01 6.029295e-01 6.079303e-01 6.129071e-01
##  [106] 6.178596e-01 6.227878e-01 6.276914e-01 6.325702e-01 6.374240e-01
##  [111] 6.422527e-01 6.470560e-01 6.518337e-01 6.565858e-01 6.613119e-01
##  [116] 6.660119e-01 6.706856e-01 6.753328e-01 6.799534e-01 6.845471e-01
##  [121] 6.891138e-01 6.936533e-01 6.981654e-01 7.026500e-01 7.071068e-01
##  [126] 7.115357e-01 7.159365e-01 7.203090e-01 7.246531e-01 7.289686e-01
##  [131] 7.332553e-01 7.375131e-01 7.417418e-01 7.459411e-01 7.501111e-01
##  [136] 7.542514e-01 7.583619e-01 7.624425e-01 7.664930e-01 7.705132e-01
##  [141] 7.745031e-01 7.784623e-01 7.823908e-01 7.862884e-01 7.901550e-01
##  [146] 7.939904e-01 7.977944e-01 8.015670e-01 8.053079e-01 8.090170e-01
##  [151] 8.126942e-01 8.163393e-01 8.199521e-01 8.235326e-01 8.270806e-01
##  [156] 8.305959e-01 8.340784e-01 8.375280e-01 8.409446e-01 8.443279e-01
##  [161] 8.476779e-01 8.509945e-01 8.542774e-01 8.575267e-01 8.607420e-01
##  [166] 8.639234e-01 8.670707e-01 8.701838e-01 8.732625e-01 8.763067e-01
##  [171] 8.793163e-01 8.822912e-01 8.852313e-01 8.881364e-01 8.910065e-01
##  [176] 8.938414e-01 8.966410e-01 8.994053e-01 9.021340e-01 9.048271e-01
##  [181] 9.074844e-01 9.101060e-01 9.126916e-01 9.152412e-01 9.177546e-01
##  [186] 9.202318e-01 9.226727e-01 9.250772e-01 9.274452e-01 9.297765e-01
##  [191] 9.320711e-01 9.343289e-01 9.365499e-01 9.387339e-01 9.408808e-01
##  [196] 9.429905e-01 9.450631e-01 9.470983e-01 9.490961e-01 9.510565e-01
##  [201] 9.529793e-01 9.548645e-01 9.567121e-01 9.585218e-01 9.602937e-01
##  [206] 9.620277e-01 9.637237e-01 9.653816e-01 9.670015e-01 9.685832e-01
##  [211] 9.701266e-01 9.716317e-01 9.730985e-01 9.745269e-01 9.759168e-01
##  [216] 9.772681e-01 9.785809e-01 9.798551e-01 9.810905e-01 9.822873e-01
##  [221] 9.834452e-01 9.845643e-01 9.856446e-01 9.866859e-01 9.876883e-01
##  [226] 9.886517e-01 9.895761e-01 9.904614e-01 9.913076e-01 9.921147e-01
##  [231] 9.928826e-01 9.936113e-01 9.943008e-01 9.949510e-01 9.955620e-01
```

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## [236] 9.961336e-01 9.966659e-01 9.971589e-01 9.976125e-01 9.980267e-01
## [241] 9.984016e-01 9.987370e-01 9.990329e-01 9.992895e-01 9.995066e-01
## [246] 9.996842e-01 9.998224e-01 9.999210e-01 9.999803e-01 1.000000e+00
## [251] 9.999803e-01 9.999210e-01 9.998224e-01 9.996842e-01 9.995066e-01
## [256] 9.992895e-01 9.990329e-01 9.987370e-01 9.984016e-01 9.980267e-01
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## [266] 9.949510e-01 9.943008e-01 9.936113e-01 9.928826e-01 9.921147e-01
## [271] 9.913076e-01 9.904614e-01 9.895761e-01 9.886517e-01 9.876883e-01
## [276] 9.866859e-01 9.856446e-01 9.845643e-01 9.834452e-01 9.822873e-01
## [281] 9.810905e-01 9.798551e-01 9.785809e-01 9.772681e-01 9.759168e-01
## [286] 9.745269e-01 9.730985e-01 9.716317e-01 9.701266e-01 9.685832e-01
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## [296] 9.585218e-01 9.567121e-01 9.548645e-01 9.529793e-01 9.510565e-01
## [301] 9.490961e-01 9.470983e-01 9.450631e-01 9.429905e-01 9.408808e-01
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## [311] 9.274452e-01 9.250772e-01 9.226727e-01 9.202318e-01 9.177546e-01
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## [321] 9.021340e-01 8.994053e-01 8.966410e-01 8.938414e-01 8.910065e-01
## [326] 8.881364e-01 8.852313e-01 8.822912e-01 8.793163e-01 8.763067e-01
## [331] 8.732625e-01 8.701838e-01 8.670707e-01 8.639234e-01 8.607420e-01
## [336] 8.575267e-01 8.542774e-01 8.509945e-01 8.476779e-01 8.443279e-01
## [341] 8.409446e-01 8.375280e-01 8.340784e-01 8.305959e-01 8.270806e-01
## [346] 8.235326e-01 8.199521e-01 8.163393e-01 8.126942e-01 8.090170e-01
## [351] 8.053079e-01 8.015670e-01 7.977944e-01 7.939904e-01 7.901550e-01
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## [366] 7.459411e-01 7.417418e-01 7.375131e-01 7.332553e-01 7.289686e-01
## [371] 7.246531e-01 7.203090e-01 7.159365e-01 7.115357e-01 7.071068e-01
## [376] 7.026500e-01 6.981654e-01 6.936533e-01 6.891138e-01 6.845471e-01
## [381] 6.799534e-01 6.753328e-01 6.706856e-01 6.660119e-01 6.613119e-01
## [386] 6.565858e-01 6.518337e-01 6.470560e-01 6.422527e-01 6.374240e-01
## [391] 6.325702e-01 6.276914e-01 6.227878e-01 6.178596e-01 6.129071e-01
## [396] 6.079303e-01 6.029295e-01 5.979050e-01 5.928568e-01 5.877853e-01
## [401] 5.826905e-01 5.775727e-01 5.724321e-01 5.672689e-01 5.620834e-01
## [406] 5.568756e-01 5.516459e-01 5.463943e-01 5.411213e-01 5.358268e-01
## [411] 5.305112e-01 5.251746e-01 5.198173e-01 5.144395e-01 5.090414e-01
## [416] 5.036232e-01 4.981851e-01 4.927273e-01 4.872501e-01 4.817537e-01
## [421] 4.762382e-01 4.707039e-01 4.651511e-01 4.595799e-01 4.539905e-01
## [426] 4.483832e-01 4.427582e-01 4.371158e-01 4.314560e-01 4.257793e-01
## [431] 4.200857e-01 4.143756e-01 4.086491e-01 4.029064e-01 3.971479e-01
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## [441] 3.622754e-01 3.564119e-01 3.505343e-01 3.446429e-01 3.387379e-01
## [446] 3.328195e-01 3.268880e-01 3.209436e-01 3.149865e-01 3.090170e-01
## [451] 3.030353e-01 2.970416e-01 2.910362e-01 2.850193e-01 2.789911e-01
## [456] 2.729519e-01 2.669020e-01 2.608415e-01 2.547707e-01 2.486899e-01
```

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##   [461]   2.425992e-01   2.364990e-01   2.303894e-01   2.242708e-01   2.181432e-01
##   [466]   2.120071e-01   2.058626e-01   1.997100e-01   1.935495e-01   1.873813e-01
##   [471]   1.812058e-01   1.750231e-01   1.688334e-01   1.626372e-01   1.564345e-01
##   [476]   1.502256e-01   1.440108e-01   1.377903e-01   1.315644e-01   1.253332e-01
##   [481]   1.190972e-01   1.128564e-01   1.066112e-01   1.003617e-01   9.410831e-02
##   [486]   8.785120e-02   8.159061e-02   7.532681e-02   6.906003e-02   6.279052e-02
##   [491]   5.651853e-02   5.024432e-02   4.396812e-02   3.769018e-02   3.141076e-02
##   [496]   2.513010e-02   1.884844e-02   1.256604e-02   6.283144e-03   1.224606e-16
##   [501]  -6.283144e-03  -1.256604e-02  -1.884844e-02  -2.513010e-02  -3.141076e-02
##   [506]  -3.769018e-02  -4.396812e-02  -5.024432e-02  -5.651853e-02  -6.279052e-02
##   [511]  -6.906003e-02  -7.532681e-02  -8.159061e-02  -8.785120e-02  -9.410831e-02
##   [516]  -1.003617e-01  -1.066112e-01  -1.128564e-01  -1.190972e-01  -1.253332e-01
##   [521]  -1.315644e-01  -1.377903e-01  -1.440108e-01  -1.502256e-01  -1.564345e-01
##   [526]  -1.626372e-01  -1.688334e-01  -1.750231e-01  -1.812058e-01  -1.873813e-01
##   [531]  -1.935495e-01  -1.997100e-01  -2.058626e-01  -2.120071e-01  -2.181432e-01
##   [536]  -2.242708e-01  -2.303894e-01  -2.364990e-01  -2.425992e-01  -2.486899e-01
##   [541]  -2.547707e-01  -2.608415e-01  -2.669020e-01  -2.729519e-01  -2.789911e-01
##   [546]  -2.850193e-01  -2.910362e-01  -2.970416e-01  -3.030353e-01  -3.090170e-01
##   [551]  -3.149865e-01  -3.209436e-01  -3.268880e-01  -3.328195e-01  -3.387379e-01
##   [556]  -3.446429e-01  -3.505343e-01  -3.564119e-01  -3.622754e-01  -3.681246e-01
##   [561]  -3.739592e-01  -3.797791e-01  -3.855840e-01  -3.913737e-01  -3.971479e-01
##   [566]  -4.029064e-01  -4.086491e-01  -4.143756e-01  -4.200857e-01  -4.257793e-01
##   [571]  -4.314560e-01  -4.371158e-01  -4.427582e-01  -4.483832e-01  -4.539905e-01
##   [576]  -4.595799e-01  -4.651511e-01  -4.707039e-01  -4.762382e-01  -4.817537e-01
##   [581]  -4.872501e-01  -4.927273e-01  -4.981851e-01  -5.036232e-01  -5.090414e-01
##   [586]  -5.144395e-01  -5.198173e-01  -5.251746e-01  -5.305112e-01  -5.358268e-01
##   [591]  -5.411213e-01  -5.463943e-01  -5.516459e-01  -5.568756e-01  -5.620834e-01
##   [596]  -5.672689e-01  -5.724321e-01  -5.775727e-01  -5.826905e-01  -5.877853e-01
##   [601]  -5.928568e-01  -5.979050e-01  -6.029295e-01  -6.079303e-01  -6.129071e-01
##   [606]  -6.178596e-01  -6.227878e-01  -6.276914e-01  -6.325702e-01  -6.374240e-01
##   [611]  -6.422527e-01  -6.470560e-01  -6.518337e-01  -6.565858e-01  -6.613119e-01
##   [616]  -6.660119e-01  -6.706856e-01  -6.753328e-01  -6.799534e-01  -6.845471e-01
##   [621]  -6.891138e-01  -6.936533e-01  -6.981654e-01  -7.026500e-01  -7.071068e-01
##   [626]  -7.115357e-01  -7.159365e-01  -7.203090e-01  -7.246531e-01  -7.289686e-01
##   [631]  -7.332553e-01  -7.375131e-01  -7.417418e-01  -7.459411e-01  -7.501111e-01
##   [636]  -7.542514e-01  -7.583619e-01  -7.624425e-01  -7.664930e-01  -7.705132e-01
##   [641]  -7.745031e-01  -7.784623e-01  -7.823908e-01  -7.862884e-01  -7.901550e-01
##   [646]  -7.939904e-01  -7.977944e-01  -8.015670e-01  -8.053079e-01  -8.090170e-01
##   [651]  -8.126942e-01  -8.163393e-01  -8.199521e-01  -8.235326e-01  -8.270806e-01
##   [656]  -8.305959e-01  -8.340784e-01  -8.375280e-01  -8.409446e-01  -8.443279e-01
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##   [666]  -8.639234e-01  -8.670707e-01  -8.701838e-01  -8.732625e-01  -8.763067e-01
##   [671]  -8.793163e-01  -8.822912e-01  -8.852313e-01  -8.881364e-01  -8.910065e-01
##   [676]  -8.938414e-01  -8.966410e-01  -8.994053e-01  -9.021340e-01  -9.048271e-01
##   [681]  -9.074844e-01  -9.101060e-01  -9.126916e-01  -9.152412e-01  -9.177546e-01
```

```
## [686] -9.202318e-01 -9.226727e-01 -9.250772e-01 -9.274452e-01 -9.297765e-01
## [691] -9.320711e-01 -9.343289e-01 -9.365499e-01 -9.387339e-01 -9.408808e-01
## [696] -9.429905e-01 -9.450631e-01 -9.470983e-01 -9.490961e-01 -9.510565e-01
## [701] -9.529793e-01 -9.548645e-01 -9.567121e-01 -9.585218e-01 -9.602937e-01
## [706] -9.620277e-01 -9.637237e-01 -9.653816e-01 -9.670015e-01 -9.685832e-01
## [711] -9.701266e-01 -9.716317e-01 -9.730985e-01 -9.745269e-01 -9.759168e-01
## [716] -9.772681e-01 -9.785809e-01 -9.798551e-01 -9.810905e-01 -9.822873e-01
## [721] -9.834452e-01 -9.845643e-01 -9.856446e-01 -9.866859e-01 -9.876883e-01
## [726] -9.886517e-01 -9.895761e-01 -9.904614e-01 -9.913076e-01 -9.921147e-01
## [731] -9.928826e-01 -9.936113e-01 -9.943008e-01 -9.949510e-01 -9.955620e-01
## [736] -9.961336e-01 -9.966659e-01 -9.971589e-01 -9.976125e-01 -9.980267e-01
## [741] -9.984016e-01 -9.987370e-01 -9.990329e-01 -9.992895e-01 -9.995066e-01
## [746] -9.996842e-01 -9.998224e-01 -9.999210e-01 -9.999803e-01 -1.000000e+00
## [751] -9.999803e-01 -9.999210e-01 -9.998224e-01 -9.996842e-01 -9.995066e-01
## [756] -9.992895e-01 -9.990329e-01 -9.987370e-01 -9.984016e-01 -9.980267e-01
## [761] -9.976125e-01 -9.971589e-01 -9.966659e-01 -9.961336e-01 -9.955620e-01
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## [771] -9.913076e-01 -9.904614e-01 -9.895761e-01 -9.886517e-01 -9.876883e-01
## [776] -9.866859e-01 -9.856446e-01 -9.845643e-01 -9.834452e-01 -9.822873e-01
## [781] -9.810905e-01 -9.798551e-01 -9.785809e-01 -9.772681e-01 -9.759168e-01
## [786] -9.745269e-01 -9.730985e-01 -9.716317e-01 -9.701266e-01 -9.685832e-01
## [791] -9.670015e-01 -9.653816e-01 -9.637237e-01 -9.620277e-01 -9.602937e-01
## [796] -9.585218e-01 -9.567121e-01 -9.548645e-01 -9.529793e-01 -9.510565e-01
## [801] -9.490961e-01 -9.470983e-01 -9.450631e-01 -9.429905e-01 -9.408808e-01
## [806] -9.387339e-01 -9.365499e-01 -9.343289e-01 -9.320711e-01 -9.297765e-01
## [811] -9.274452e-01 -9.250772e-01 -9.226727e-01 -9.202318e-01 -9.177546e-01
## [816] -9.152412e-01 -9.126916e-01 -9.101060e-01 -9.074844e-01 -9.048271e-01
## [821] -9.021340e-01 -8.994053e-01 -8.966410e-01 -8.938414e-01 -8.910065e-01
## [826] -8.881364e-01 -8.852313e-01 -8.822912e-01 -8.793163e-01 -8.763067e-01
## [831] -8.732625e-01 -8.701838e-01 -8.670707e-01 -8.639234e-01 -8.607420e-01
## [836] -8.575267e-01 -8.542774e-01 -8.509945e-01 -8.476779e-01 -8.443279e-01
## [841] -8.409446e-01 -8.375280e-01 -8.340784e-01 -8.305959e-01 -8.270806e-01
## [846] -8.235326e-01 -8.199521e-01 -8.163393e-01 -8.126942e-01 -8.090170e-01
## [851] -8.053079e-01 -8.015670e-01 -7.977944e-01 -7.939904e-01 -7.901550e-01
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## [861] -7.664930e-01 -7.624425e-01 -7.583619e-01 -7.542514e-01 -7.501111e-01
## [866] -7.459411e-01 -7.417418e-01 -7.375131e-01 -7.332553e-01 -7.289686e-01
## [871] -7.246531e-01 -7.203090e-01 -7.159365e-01 -7.115357e-01 -7.071068e-01
## [876] -7.026500e-01 -6.981654e-01 -6.936533e-01 -6.891138e-01 -6.845471e-01
## [881] -6.799534e-01 -6.753328e-01 -6.706856e-01 -6.660119e-01 -6.613119e-01
## [886] -6.565858e-01 -6.518337e-01 -6.470560e-01 -6.422527e-01 -6.374240e-01
## [891] -6.325702e-01 -6.276914e-01 -6.227878e-01 -6.178596e-01 -6.129071e-01
## [896] -6.079303e-01 -6.029295e-01 -5.979050e-01 -5.928568e-01 -5.877853e-01
## [901] -5.826905e-01 -5.775727e-01 -5.724321e-01 -5.672689e-01 -5.620834e-01
## [906] -5.568756e-01 -5.516459e-01 -5.463943e-01 -5.411213e-01 -5.358268e-01
```

```
##  [911] -5.305112e-01 -5.251746e-01 -5.198173e-01 -5.144395e-01 -5.090414e-01
##  [916] -5.036232e-01 -4.981851e-01 -4.927273e-01 -4.872501e-01 -4.817537e-01
##  [921] -4.762382e-01 -4.707039e-01 -4.651511e-01 -4.595799e-01 -4.539905e-01
##  [926] -4.483832e-01 -4.427582e-01 -4.371158e-01 -4.314560e-01 -4.257793e-01
##  [931] -4.200857e-01 -4.143756e-01 -4.086491e-01 -4.029064e-01 -3.971479e-01
##  [936] -3.913737e-01 -3.855840e-01 -3.797791e-01 -3.739592e-01 -3.681246e-01
##  [941] -3.622754e-01 -3.564119e-01 -3.505343e-01 -3.446429e-01 -3.387379e-01
##  [946] -3.328195e-01 -3.268880e-01 -3.209436e-01 -3.149865e-01 -3.090170e-01
##  [951] -3.030353e-01 -2.970416e-01 -2.910362e-01 -2.850193e-01 -2.789911e-01
##  [956] -2.729519e-01 -2.669020e-01 -2.608415e-01 -2.547707e-01 -2.486899e-01
##  [961] -2.425992e-01 -2.364990e-01 -2.303894e-01 -2.242708e-01 -2.181432e-01
##  [966] -2.120071e-01 -2.058626e-01 -1.997100e-01 -1.935495e-01 -1.873813e-01
##  [971] -1.812058e-01 -1.750231e-01 -1.688334e-01 -1.626372e-01 -1.564345e-01
##  [976] -1.502256e-01 -1.440108e-01 -1.377903e-01 -1.315644e-01 -1.253332e-01
##  [981] -1.190972e-01 -1.128564e-01 -1.066112e-01 -1.003617e-01 -9.410831e-02
##  [986] -8.785120e-02 -8.159061e-02 -7.532681e-02 -6.906003e-02 -6.279052e-02
##  [991] -5.651853e-02 -5.024432e-02 -4.396812e-02 -3.769018e-02 -3.141076e-02
##  [996] -2.513010e-02 -1.884844e-02 -1.256604e-02 -6.283144e-03 -2.449213e-16
```

```
x_1=sin(t_i)
```

```
cos(4*t_i)
```

```
##    [1]  0.99968419  0.99873696  0.99715890  0.99495102  0.99211470  0.98865174
##    [7]  0.98456433  0.97985505  0.97452687  0.96858316  0.96202767  0.95486454
##   [13]  0.94709830  0.93873386  0.92977649  0.92023185  0.91010597  0.89940525
##   [19]  0.88813645  0.87630668  0.86392342  0.85099448  0.83752804  0.82353260
##   [25]  0.80901699  0.79399040  0.77846230  0.76244251  0.74594115  0.72896863
##   [31]  0.71153568  0.69365331  0.67533281  0.65658576  0.63742399  0.61785961
##   [37]  0.59790498  0.57757270  0.55687562  0.53582679  0.51443953  0.49272734
##   [43]  0.47070393  0.44838322  0.42577929  0.40290644  0.37977910  0.35641188
##   [49]  0.33281954  0.30901699  0.28501926  0.26084151  0.23649900  0.21200711
##   [55]  0.18738131  0.16263717  0.13779029  0.11285638  0.08785120  0.06279052
##   [61]  0.03769018  0.01256604 -0.01256604 -0.03769018 -0.06279052 -0.08785120
##   [67] -0.11285638 -0.13779029 -0.16263717 -0.18738131 -0.21200711 -0.23649900
##   [73] -0.26084151 -0.28501926 -0.30901699 -0.33281954 -0.35641188 -0.37977910
##   [79] -0.40290644 -0.42577929 -0.44838322 -0.47070393 -0.49272734 -0.51443953
##   [85] -0.53582679 -0.55687562 -0.57757270 -0.59790498 -0.61785961 -0.63742399
##   [91] -0.65658576 -0.67533281 -0.69365331 -0.71153568 -0.72896863 -0.74594115
##   [97] -0.76244251 -0.77846230 -0.79399040 -0.80901699 -0.82353260 -0.83752804
##  [103] -0.85099448 -0.86392342 -0.87630668 -0.88813645 -0.89940525 -0.91010597
##  [109] -0.92023185 -0.92977649 -0.93873386 -0.94709830 -0.95486454 -0.96202767
##  [115] -0.96858316 -0.97452687 -0.97985505 -0.98456433 -0.98865174 -0.99211470
##  [121] -0.99495102 -0.99715890 -0.99873696 -0.99968419 -1.00000000 -0.99968419
##  [127] -0.99873696 -0.99715890 -0.99495102 -0.99211470 -0.98865174 -0.98456433
##  [133] -0.97985505 -0.97452687 -0.96858316 -0.96202767 -0.95486454 -0.94709830
```

```
##   [139] -0.93873386 -0.92977649 -0.92023185 -0.91010597 -0.89940525 -0.88813645
##   [145] -0.87630668 -0.86392342 -0.85099448 -0.83752804 -0.82353260 -0.80901699
##   [151] -0.79399040 -0.77846230 -0.76244251 -0.74594115 -0.72896863 -0.71153568
##   [157] -0.69365331 -0.67533281 -0.65658576 -0.63742399 -0.61785961 -0.59790498
##   [163] -0.57757270 -0.55687562 -0.53582679 -0.51443953 -0.49272734 -0.47070393
##   [169] -0.44838322 -0.42577929 -0.40290644 -0.37977910 -0.35641188 -0.33281954
##   [175] -0.30901699 -0.28501926 -0.26084151 -0.23649900 -0.21200711 -0.18738131
##   [181] -0.16263717 -0.13779029 -0.11285638 -0.08785120 -0.06279052 -0.03769018
##   [187] -0.01256604  0.01256604  0.03769018  0.06279052  0.08785120  0.11285638
##   [193]  0.13779029  0.16263717  0.18738131  0.21200711  0.23649900  0.26084151
##   [199]  0.28501926  0.30901699  0.33281954  0.35641188  0.37977910  0.40290644
##   [205]  0.42577929  0.44838322  0.47070393  0.49272734  0.51443953  0.53582679
##   [211]  0.55687562  0.57757270  0.59790498  0.61785961  0.63742399  0.65658576
##   [217]  0.67533281  0.69365331  0.71153568  0.72896863  0.74594115  0.76244251
##   [223]  0.77846230  0.79399040  0.80901699  0.82353260  0.83752804  0.85099448
##   [229]  0.86392342  0.87630668  0.88813645  0.89940525  0.91010597  0.92023185
##   [235]  0.92977649  0.93873386  0.94709830  0.95486454  0.96202767  0.96858316
##   [241]  0.97452687  0.97985505  0.98456433  0.98865174  0.99211470  0.99495102
##   [247]  0.99715890  0.99873696  0.99968419  1.00000000  0.99968419  0.99873696
##   [253]  0.99715890  0.99495102  0.99211470  0.98865174  0.98456433  0.97985505
##   [259]  0.97452687  0.96858316  0.96202767  0.95486454  0.94709830  0.93873386
##   [265]  0.92977649  0.92023185  0.91010597  0.89940525  0.88813645  0.87630668
##   [271]  0.86392342  0.85099448  0.83752804  0.82353260  0.80901699  0.79399040
##   [277]  0.77846230  0.76244251  0.74594115  0.72896863  0.71153568  0.69365331
##   [283]  0.67533281  0.65658576  0.63742399  0.61785961  0.59790498  0.57757270
##   [289]  0.55687562  0.53582679  0.51443953  0.49272734  0.47070393  0.44838322
##   [295]  0.42577929  0.40290644  0.37977910  0.35641188  0.33281954  0.30901699
##   [301]  0.28501926  0.26084151  0.23649900  0.21200711  0.18738131  0.16263717
##   [307]  0.13779029  0.11285638  0.08785120  0.06279052  0.03769018  0.01256604
##   [313] -0.01256604 -0.03769018 -0.06279052 -0.08785120 -0.11285638 -0.13779029
##   [319] -0.16263717 -0.18738131 -0.21200711 -0.23649900 -0.26084151 -0.28501926
##   [325] -0.30901699 -0.33281954 -0.35641188 -0.37977910 -0.40290644 -0.42577929
##   [331] -0.44838322 -0.47070393 -0.49272734 -0.51443953 -0.53582679 -0.55687562
##   [337] -0.57757270 -0.59790498 -0.61785961 -0.63742399 -0.65658576 -0.67533281
##   [343] -0.69365331 -0.71153568 -0.72896863 -0.74594115 -0.76244251 -0.77846230
##   [349] -0.79399040 -0.80901699 -0.82353260 -0.83752804 -0.85099448 -0.86392342
##   [355] -0.87630668 -0.88813645 -0.89940525 -0.91010597 -0.92023185 -0.92977649
##   [361] -0.93873386 -0.94709830 -0.95486454 -0.96202767 -0.96858316 -0.97452687
##   [367] -0.97985505 -0.98456433 -0.98865174 -0.99211470 -0.99495102 -0.99715890
##   [373] -0.99873696 -0.99968419 -1.00000000 -0.99968419 -0.99873696 -0.99715890
##   [379] -0.99495102 -0.99211470 -0.98865174 -0.98456433 -0.97985505 -0.97452687
##   [385] -0.96858316 -0.96202767 -0.95486454 -0.94709830 -0.93873386 -0.92977649
##   [391] -0.92023185 -0.91010597 -0.89940525 -0.88813645 -0.87630668 -0.86392342
##   [397] -0.85099448 -0.83752804 -0.82353260 -0.80901699 -0.79399040 -0.77846230
##   [403] -0.76244251 -0.74594115 -0.72896863 -0.71153568 -0.69365331 -0.67533281
```

```
## [409] -0.65658576 -0.63742399 -0.61785961 -0.59790498 -0.57757270 -0.55687562
## [415] -0.53582679 -0.51443953 -0.49272734 -0.47070393 -0.44838322 -0.42577929
## [421] -0.40290644 -0.37977910 -0.35641188 -0.33281954 -0.30901699 -0.28501926
## [427] -0.26084151 -0.23649900 -0.21200711 -0.18738131 -0.16263717 -0.13779029
## [433] -0.11285638 -0.08785120 -0.06279052 -0.03769018 -0.01256604  0.01256604
## [439]  0.03769018  0.06279052  0.08785120  0.11285638  0.13779029  0.16263717
## [445]  0.18738131  0.21200711  0.23649900  0.26084151  0.28501926  0.30901699
## [451]  0.33281954  0.35641188  0.37977910  0.40290644  0.42577929  0.44838322
## [457]  0.47070393  0.49272734  0.51443953  0.53582679  0.55687562  0.57757270
## [463]  0.59790498  0.61785961  0.63742399  0.65658576  0.67533281  0.69365331
## [469]  0.71153568  0.72896863  0.74594115  0.76244251  0.77846230  0.79399040
## [475]  0.80901699  0.82353260  0.83752804  0.85099448  0.86392342  0.87630668
## [481]  0.88813645  0.89940525  0.91010597  0.92023185  0.92977649  0.93873386
## [487]  0.94709830  0.95486454  0.96202767  0.96858316  0.97452687  0.97985505
## [493]  0.98456433  0.98865174  0.99211470  0.99495102  0.99715890  0.99873696
## [499]  0.99968419  1.00000000  0.99968419  0.99873696  0.99715890  0.99495102
## [505]  0.99211470  0.98865174  0.98456433  0.97985505  0.97452687  0.96858316
## [511]  0.96202767  0.95486454  0.94709830  0.93873386  0.92977649  0.92023185
## [517]  0.91010597  0.89940525  0.88813645  0.87630668  0.86392342  0.85099448
## [523]  0.83752804  0.82353260  0.80901699  0.79399040  0.77846230  0.76244251
## [529]  0.74594115  0.72896863  0.71153568  0.69365331  0.67533281  0.65658576
## [535]  0.63742399  0.61785961  0.59790498  0.57757270  0.55687562  0.53582679
## [541]  0.51443953  0.49272734  0.47070393  0.44838322  0.42577929  0.40290644
## [547]  0.37977910  0.35641188  0.33281954  0.30901699  0.28501926  0.26084151
## [553]  0.23649900  0.21200711  0.18738131  0.16263717  0.13779029  0.11285638
## [559]  0.08785120  0.06279052  0.03769018  0.01256604 -0.01256604 -0.03769018
## [565] -0.06279052 -0.08785120 -0.11285638 -0.13779029 -0.16263717 -0.18738131
## [571] -0.21200711 -0.23649900 -0.26084151 -0.28501926 -0.30901699 -0.33281954
## [577] -0.35641188 -0.37977910 -0.40290644 -0.42577929 -0.44838322 -0.47070393
## [583] -0.49272734 -0.51443953 -0.53582679 -0.55687562 -0.57757270 -0.59790498
## [589] -0.61785961 -0.63742399 -0.65658576 -0.67533281 -0.69365331 -0.71153568
## [595] -0.72896863 -0.74594115 -0.76244251 -0.77846230 -0.79399040 -0.80901699
## [601] -0.82353260 -0.83752804 -0.85099448 -0.86392342 -0.87630668 -0.88813645
## [607] -0.89940525 -0.91010597 -0.92023185 -0.92977649 -0.93873386 -0.94709830
## [613] -0.95486454 -0.96202767 -0.96858316 -0.97452687 -0.97985505 -0.98456433
## [619] -0.98865174 -0.99211470 -0.99495102 -0.99715890 -0.99873696 -0.99968419
## [625] -1.00000000 -0.99968419 -0.99873696 -0.99715890 -0.99495102 -0.99211470
## [631] -0.98865174 -0.98456433 -0.97985505 -0.97452687 -0.96858316 -0.96202767
## [637] -0.95486454 -0.94709830 -0.93873386 -0.92977649 -0.92023185 -0.91010597
## [643] -0.89940525 -0.88813645 -0.87630668 -0.86392342 -0.85099448 -0.83752804
## [649] -0.82353260 -0.80901699 -0.79399040 -0.77846230 -0.76244251 -0.74594115
## [655] -0.72896863 -0.71153568 -0.69365331 -0.67533281 -0.65658576 -0.63742399
## [661] -0.61785961 -0.59790498 -0.57757270 -0.55687562 -0.53582679 -0.51443953
## [667] -0.49272734 -0.47070393 -0.44838322 -0.42577929 -0.40290644 -0.37977910
## [673] -0.35641188 -0.33281954 -0.30901699 -0.28501926 -0.26084151 -0.23649900
```

```
## [679] -0.21200711 -0.18738131 -0.16263717 -0.13779029 -0.11285638 -0.08785120
## [685] -0.06279052 -0.03769018 -0.01256604  0.01256604  0.03769018  0.06279052
## [691]  0.08785120  0.11285638  0.13779029  0.16263717  0.18738131  0.21200711
## [697]  0.23649900  0.26084151  0.28501926  0.30901699  0.33281954  0.35641188
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## [709]  0.51443953  0.53582679  0.55687562  0.57757270  0.59790498  0.61785961
## [715]  0.63742399  0.65658576  0.67533281  0.69365331  0.71153568  0.72896863
## [721]  0.74594115  0.76244251  0.77846230  0.79399040  0.80901699  0.82353260
## [727]  0.83752804  0.85099448  0.86392342  0.87630668  0.88813645  0.89940525
## [733]  0.91010597  0.92023185  0.92977649  0.93873386  0.94709830  0.95486454
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## [751]  0.99968419  0.99873696  0.99715890  0.99495102  0.99211470  0.98865174
## [757]  0.98456433  0.97985505  0.97452687  0.96858316  0.96202767  0.95486454
## [763]  0.94709830  0.93873386  0.92977649  0.92023185  0.91010597  0.89940525
## [769]  0.88813645  0.87630668  0.86392342  0.85099448  0.83752804  0.82353260
## [775]  0.80901699  0.79399040  0.77846230  0.76244251  0.74594115  0.72896863
## [781]  0.71153568  0.69365331  0.67533281  0.65658576  0.63742399  0.61785961
## [787]  0.59790498  0.57757270  0.55687562  0.53582679  0.51443953  0.49272734
## [793]  0.47070393  0.44838322  0.42577929  0.40290644  0.37977910  0.35641188
## [799]  0.33281954  0.30901699  0.28501926  0.26084151  0.23649900  0.21200711
## [805]  0.18738131  0.16263717  0.13779029  0.11285638  0.08785120  0.06279052
## [811]  0.03769018  0.01256604 -0.01256604 -0.03769018 -0.06279052 -0.08785120
## [817] -0.11285638 -0.13779029 -0.16263717 -0.18738131 -0.21200711 -0.23649900
## [823] -0.26084151 -0.28501926 -0.30901699 -0.33281954 -0.35641188 -0.37977910
## [829] -0.40290644 -0.42577929 -0.44838322 -0.47070393 -0.49272734 -0.51443953
## [835] -0.53582679 -0.55687562 -0.57757270 -0.59790498 -0.61785961 -0.63742399
## [841] -0.65658576 -0.67533281 -0.69365331 -0.71153568 -0.72896863 -0.74594115
## [847] -0.76244251 -0.77846230 -0.79399040 -0.80901699 -0.82353260 -0.83752804
## [853] -0.85099448 -0.86392342 -0.87630668 -0.88813645 -0.89940525 -0.91010597
## [859] -0.92023185 -0.92977649 -0.93873386 -0.94709830 -0.95486454 -0.96202767
## [865] -0.96858316 -0.97452687 -0.97985505 -0.98456433 -0.98865174 -0.99211470
## [871] -0.99495102 -0.99715890 -0.99873696 -0.99968419 -1.00000000 -0.99968419
## [877] -0.99873696 -0.99715890 -0.99495102 -0.99211470 -0.98865174 -0.98456433
## [883] -0.97985505 -0.97452687 -0.96858316 -0.96202767 -0.95486454 -0.94709830
## [889] -0.93873386 -0.92977649 -0.92023185 -0.91010597 -0.89940525 -0.88813645
## [895] -0.87630668 -0.86392342 -0.85099448 -0.83752804 -0.82353260 -0.80901699
## [901] -0.79399040 -0.77846230 -0.76244251 -0.74594115 -0.72896863 -0.71153568
## [907] -0.69365331 -0.67533281 -0.65658576 -0.63742399 -0.61785961 -0.59790498
## [913] -0.57757270 -0.55687562 -0.53582679 -0.51443953 -0.49272734 -0.47070393
## [919] -0.44838322 -0.42577929 -0.40290644 -0.37977910 -0.35641188 -0.33281954
## [925] -0.30901699 -0.28501926 -0.26084151 -0.23649900 -0.21200711 -0.18738131
## [931] -0.16263717 -0.13779029 -0.11285638 -0.08785120 -0.06279052 -0.03769018
## [937] -0.01256604  0.01256604  0.03769018  0.06279052  0.08785120  0.11285638
## [943]  0.13779029  0.16263717  0.18738131  0.21200711  0.23649900  0.26084151
```

```
##  [949]   0.28501926   0.30901699   0.33281954   0.35641188   0.37977910   0.40290644
##  [955]   0.42577929   0.44838322   0.47070393   0.49272734   0.51443953   0.53582679
##  [961]   0.55687562   0.57757270   0.59790498   0.61785961   0.63742399   0.65658576
##  [967]   0.67533281   0.69365331   0.71153568   0.72896863   0.74594115   0.76244251
##  [973]   0.77846230   0.79399040   0.80901699   0.82353260   0.83752804   0.85099448
##  [979]   0.86392342   0.87630668   0.88813645   0.89940525   0.91010597   0.92023185
##  [985]   0.92977649   0.93873386   0.94709830   0.95486454   0.96202767   0.96858316
##  [991]   0.97452687   0.97985505   0.98456433   0.98865174   0.99211470   0.99495102
##  [997]   0.99715890   0.99873696   0.99968419   1.00000000
```

```
x_2=cos(4*t_i)
```

1번-(3)

```
y_i=1.5+5*x_1+3*x_2+epsilon
y_i
```

```
##    [1]   5.539558031   4.919816676   5.007806262   5.239767743   3.949296552
##    [6]   3.947357134   2.751719554   3.746742127   4.507076273   6.016023301
##   [11]   7.263156605   5.588686040   5.653084122   3.530681889   6.548678230
##   [16]   4.689898650   3.835207944   2.962687640   4.407866485   5.554236014
##   [21]   3.639620205   4.772920670   5.745017276   4.694821046   5.335841906
##   [26]   1.320054289   3.632643393   6.480889375   6.714892369   5.358728231
##   [31]   6.005491590   4.386028629   5.220671692   3.092687281   5.023768698
##   [36]   5.351690331   4.671873579   4.988508294   2.752665662   3.064416216
##   [41]   4.045248172   6.322285715   2.456617532   4.868614587   4.868961002
##   [46]   5.641580735   4.808095577   2.554314654   3.249228048   4.684328699
##   [51]   3.668246005   5.053260251   3.220367867   4.891638017   4.223451636
##   [56]   3.855129665   4.724218661   4.598207477   4.393970342   1.269634745
##   [61]   2.452399243   5.811328621   4.071202577   2.481923330   2.400426912
##   [66]   3.674120179   3.852537537   4.205312532   4.013125551   3.766792184
##   [71]   2.526338070   2.715898723   2.423027905   3.125128184   0.524209880
##   [76]   1.306958182   1.507868143   2.713675288   2.612926331   3.446292470
##   [81]   2.053777317   1.196994623   1.148051897   2.675816828   0.714989652
##   [86]   2.896182900   4.200181521   2.639704741   1.123829092   2.931764523
##   [91]   2.022140792   2.917427314   2.286810813   1.307368528   2.386057061
##   [96]   3.171309675   2.451858552   2.644600636   1.731119793   0.394758536
##  [101]  -0.033103264   2.302564327   2.373622499   2.387292794   2.257802314
##  [106]   1.287180547   2.566566815   1.071541326   1.370557787   0.506668161
##  [111]   2.089222539   1.080242891   2.231768353   2.397069102   2.720298207
##  [116]   3.722730998   0.884060368   1.738741424   0.219258485   1.865515252
##  [121]   2.736252163   2.554074407   0.331687046   0.648306565   1.241581469
##  [126]   2.297333243   1.015168779   1.236753455   1.006422398   1.922688830
##  [131]   3.381956282   3.694940234   1.025597363   2.746483413   2.388750012
##  [136]   3.142373131   3.039910703   2.020591284   1.977699486   2.535296729
##  [141]   3.604480267   0.728653568   2.645758255   2.570279647   4.258398908
```

```
## [146]   4.335594281   4.546819143   1.716103933   3.253921054   5.186651924
## [151]   3.385898282   1.010227805   1.873315860   2.681884108   1.954121450
## [156]   2.935615600   3.087745493   4.050359484   2.251934953   3.782966274
## [161]   6.359997238   1.149725720   3.379538542   5.147534231   4.569375157
## [166]   4.503320919   5.349786602   6.256186728   5.040179407   3.877177491
## [171]   7.238244519   5.168457979   4.682896595   5.509693918   6.017126846
## [176]   6.938024779   5.714660173   5.695673783   6.098110626   6.376555042
## [181]   7.741002303   5.288657868   6.852068837   6.227557444   3.196891895
## [186]   7.057481286   6.928083725   6.317445510   6.952439235   6.302102316
## [191]   3.804738706   5.449114096   6.691800133   6.391332686   9.202980939
## [196]   6.738306605   7.057764140   6.934039358   9.371169437   7.697305131
## [201]   8.530113668   7.235230492   7.271752213   7.491048257   7.952735975
## [206]   7.142647270   8.829692386   5.896970355   8.394750699   8.065769827
## [211]   6.278568915   7.428468889   7.939756716   7.967676288   7.081369682
## [216]   8.995567728   8.635269548   8.644481263   9.196581450   7.414812133
## [221]   9.032584445   9.710454336   8.902333214   8.290630781   8.210505694
## [226]   6.948773706   8.880650260  10.559427509   7.839541732   9.574342521
## [231]   8.922068513   7.862415066   9.606756130   8.927807701   9.771410872
## [236]   9.093998232   9.828629111  10.321665080   8.067819671   9.057121533
## [241]   9.555496727   8.755531057   8.239372726   9.174959093  12.162252830
## [246]   8.273446188  10.888725395   6.604618177  10.284799718   9.092985158
## [251]  11.925839604   8.255864240   9.686653397   9.837296082   7.652213914
## [256]  10.002716707   9.145622633   8.000114558   9.332034861  10.002242399
## [261]   9.163317315   8.312279183   8.100847206   9.523291350  10.602150040
## [266]   7.858544759  11.324003858   8.251480580  10.020925731  10.287990819
## [271]   9.594215795  10.902856414   7.337181653   7.363443624   9.039863274
## [276]   9.978650982   9.722341654  10.616308724  10.509045776   9.653737559
## [281]   8.553666533   9.137394200   8.773658278   6.948538740   7.593569892
## [286]   8.108900688   9.008779147   8.986010850   8.926892058   5.989863435
## [291]   6.802443763   7.440561254   7.374061066   6.316330430   6.867040524
## [296]   7.223698810   8.649225519   6.129387326   6.794780207   7.692513191
## [301]   6.270822416   5.378973255   8.739276308   4.767514072   7.553827854
## [306]   7.894482077   5.900505417   5.494190061   7.883298278   5.983744570
## [311]   4.791005613   7.222332611   7.583128671   5.185100759   3.769978313
## [316]   5.757121584   4.718942931   6.065230509   5.791553197   4.878689876
## [321]   6.091195852   6.489099250   4.531540288   5.323962587   3.305613769
## [326]   5.011594543   3.789853120   2.871565458   4.439193133   4.296973941
## [331]   5.391870564   5.076693300   3.782164363   4.812838359   5.391024097
## [336]   3.603340460   5.234811534   2.753819624   4.924370429   5.297729046
## [341]   4.493641104   2.723052514   3.117102502   3.711819067   4.579456657
## [346]   2.680966278   3.889230360   2.869755057   1.419544345   4.782819398
## [351]   3.114617815   4.817403505   3.457496567   2.814642942   3.064900090
## [356]   2.846305271   3.944991309   2.782373784   1.275298772   3.325340200
## [361]   3.930442385   2.181656597   3.456258756   2.289791997   0.958781674
## [366]   2.450740583   3.157480629   3.342238293   4.751960266   2.144414413
```

```
## [371]  1.923419119  1.313469071  2.078728163  2.194179487  3.257117600
## [376]  3.148345874  0.854467368  0.006268429  3.332598039  3.541870251
## [381]  2.828508727  1.894276873  4.000397091  1.375141607 -0.073107415
## [386]  2.733362002  3.085183981  0.656552460  1.987168132  3.756401341
## [391]  1.268464365  1.912514708  1.843963483  3.221135650  0.036152162
## [396]  2.890591898  2.389834517  2.775655117  3.394241051  1.840939905
## [401]  2.317851581  1.575348905  1.156849546  0.374624748  2.048245911
## [406]  1.608032778  3.855318500  5.315121808  3.478925375  1.605395847
## [411]  2.770763198  3.937750898  1.838839797  2.626722317  1.216923136
## [416]  2.910527456  2.285051139  0.741426794  2.312835008  4.277307668
## [421]  2.809962283  2.951203814  3.190886365  3.258088729  2.680920138
## [426]  1.257856012  3.323744221  3.710706408  2.821274287  4.422661781
## [431]  2.641428173  3.788076208  2.930042208  2.735190404  3.794532869
## [436]  3.225484958  3.768523711  1.707529461  5.919830114  3.403677037
## [441]  5.776453754  2.715916804  3.757678015  4.878909129  4.692920483
## [446]  3.562800907  4.047418379  3.157914484  3.752831965  4.444815404
## [451]  2.772339951  2.546617971  5.263527130  4.748995365  4.762823004
## [456]  5.604937644  3.374175469  4.444198220  4.860429322  4.743321454
## [461]  5.558692026  4.001680145  4.496926077  4.765441935  4.215722090
## [466]  5.922596190  3.993448720  3.667899198  5.877917763  4.385024607
## [471]  4.125010440  3.649476440  3.876950153  3.724124634  4.783208377
## [476]  6.479075872  4.102861961  3.226187510  5.680803181  4.189055089
## [481]  4.298558454  6.013860522  5.376728030  4.820764126  5.518224328
## [486]  4.992539782  4.498992217  4.404268025  3.737496681  5.852167788
## [491]  4.302227977  3.033550676  4.711137200  5.967411379  5.913776939
## [496]  3.707191481  4.825326924  3.201772501  4.255398020  4.749939225
## [501]  4.205516185  3.144700561  3.624329349  2.517911628  3.073788164
## [506]  4.359968448  5.585442598  4.164107657  4.496695433  3.505588164
## [511]  3.747843559  4.420728610  3.782179164  4.162854749  4.288162816
## [516]  3.433417349  3.286201633  1.951868996  5.319888235  4.914409959
## [521]  3.221796680  3.862310329  3.242587331  4.028669689  1.893744452
## [526]  4.443971007  3.900179269  3.497943263  2.852541353  1.454437855
## [531]  4.370671298  3.216199288  3.101168446  1.144228835  3.554461505
## [536]  4.381239629  0.838177793  1.254008342  1.815960456  2.158874839
## [541]  0.560447527  0.478649820  1.712580645  2.483862517  0.869229983
## [546]  1.602485307  0.519898586  1.005978859  0.276628715  1.692867683
## [551]  0.974679838  1.250771670 -0.201451617 -0.962847019 -0.862141197
## [556] -0.751270100 -0.701678789 -0.335575247  1.745138850  1.088467054
## [561]  0.468896453 -0.663248425  0.021675286 -1.510559526 -0.103650722
## [566] -0.332247060 -0.538374084 -2.434072411 -0.032713131 -0.138543207
## [571] -3.056330683 -0.690144133 -1.425182226 -1.981873020 -3.193371419
## [576] -1.216210483 -2.299700217 -3.098597356 -1.285071770 -2.704984866
## [581] -3.096658993 -0.908068901 -2.314930718 -4.849863197 -1.942106528
## [586] -4.084814048 -1.996647203 -3.554586449 -3.010711195 -2.563118620
## [591] -2.234838632 -3.436142153 -3.084735674 -3.134286187 -0.780917445
```

```
##    [596] -3.511589275 -2.990630842 -3.149578038 -5.641098888 -3.597638100
##    [601] -3.477589290 -3.337455083 -2.949769790 -3.051179196 -5.650434801
##    [606] -1.819917602 -2.155306147 -5.522013881 -3.348914209 -5.183758038
##    [611] -6.260869040 -5.376754314 -6.128388397 -4.174268917 -4.919996891
##    [616] -3.571476766 -4.840670374 -5.725314601 -5.755467921 -5.815423905
##    [621] -7.583896733 -5.387021560 -6.089829181 -3.413168905 -4.414104017
##    [626] -5.448136064 -3.171811207 -4.842864982 -4.376314264 -4.829297114
##    [631] -6.444318833 -5.550404272 -4.187825420 -6.197191418 -6.692534504
##    [636] -5.100942448 -4.898457623 -5.652979974 -3.124613607 -5.409366276
##    [641] -6.356375768 -4.619002853 -5.012916862 -5.565885073 -6.107780113
##    [646] -5.970689940 -3.688653268 -4.450460764 -4.767670643 -3.225545977
##    [651] -6.717934766 -3.912586194 -5.561106191 -5.574327214 -5.010073062
##    [656] -5.049020043 -4.275472600 -6.298157814 -4.290819838 -6.154321611
##    [661] -4.306174371 -4.464525542 -2.929412578 -5.244522308 -4.489561642
##    [666] -3.296558099 -5.410827425 -3.460187799 -5.532253013 -4.894795281
##    [671] -5.052234809 -3.919761208 -3.151938838 -2.492599061 -3.203330367
##    [676] -2.732979076 -6.123503402 -3.571123836 -3.160358735 -3.842609822
##    [681] -1.724926357 -3.578650588 -3.097223259 -4.265006836 -3.983363785
##    [686] -4.376487481 -4.898370301 -3.157352155 -3.739292687 -2.142588850
##    [691] -4.692158382 -3.418828227 -2.123225698 -2.032997823 -2.222226085
##    [696] -0.568696935 -4.583497933 -3.169258668 -1.933120031 -3.515977113
##    [701] -1.533782851 -4.371928592 -3.674352766 -2.040332354 -4.144474735
##    [706] -0.509189512 -1.625271390 -2.219607557  1.321647736 -2.139869323
##    [711] -2.185029913 -1.589707713 -0.607605390 -2.708702375 -3.285963498
##    [716] -2.504544538 -2.079439042  0.698878672 -0.574466359 -1.419174979
##    [721] -1.139250758 -2.779034844 -0.799729582 -1.101883350 -2.412025144
##    [726] -1.690549208 -1.703551709 -0.323682852 -0.748016938 -1.886620404
##    [731] -0.159428476 -1.481470087  0.328454264 -1.532669132 -1.023972422
##    [736]  0.213529871  0.048813938 -1.877998437 -1.607506356 -0.424036178
##    [741] -0.031508158  1.884890584 -1.700499286 -0.421792254 -2.226350643
##    [746] -0.109163120  0.938615811 -0.239386282 -0.383013551  0.489984188
##    [751] -2.053577539 -0.490494933  0.089152886 -0.566482071  0.190172005
##    [756] -1.370090775 -1.911393591 -0.525957674 -1.664478910 -0.746740493
##    [761]  0.190440669  0.384913383  0.067852114 -0.345507181 -1.248150514
##    [766] -1.652043264 -1.229289008  0.407969970 -1.492419983  0.075277959
##    [771] -2.273569512 -0.414334634 -0.851791688 -1.605026160 -1.537713752
##    [776] -0.333752415 -0.131222574  0.987944312 -1.375957946 -0.002942164
##    [781] -2.354539570 -0.395317994 -2.929255204 -2.205652313 -2.814009429
##    [786] -1.928622837 -0.639731093 -2.532911230 -2.447937883 -2.234567852
##    [791] -1.447857216 -2.193627307 -2.771100125 -2.288652086 -2.399153634
##    [796] -1.086193099 -0.863225649 -4.559351200 -1.946435103 -2.264985858
##    [801] -2.664190517 -1.502902917 -1.836393906 -2.004610992 -0.745377063
##    [806] -2.851424497 -4.313112327 -2.705347631 -1.163504373 -3.989127213
##    [811] -2.005268995 -2.286509253 -4.400464432 -3.557476350 -3.605485889
##    [816] -1.154449253 -2.058896547 -2.604308960 -4.555866609 -3.516239752
```

```
##  [821] -3.502409260 -3.421586456 -1.621518996 -3.376353867 -3.809910717
##  [826] -5.089639286 -3.947776991 -4.499867478 -4.243982554 -6.326743687
##  [831] -3.889076331 -5.775901325 -5.327291685 -3.649729856 -4.177672614
##  [836] -4.089621111 -5.462252138 -5.704995214 -5.819802868 -4.937218028
##  [841] -4.747065496 -3.682561350 -4.705939442 -7.173389136 -4.084283766
##  [846] -5.943905400 -5.138585323 -4.559397031 -4.817071893 -6.741958823
##  [851] -5.424690809 -5.172253059 -4.929719743 -5.814864529 -4.276100628
##  [856] -4.429667113 -3.983432735 -5.016250233 -4.901805762 -6.115848358
##  [861] -3.506669880 -3.064259213 -6.454309339 -5.748635252 -3.386271325
##  [866] -5.179628107 -4.874021569 -5.897819681 -4.118141509 -5.227477049
##  [871] -4.426454084 -5.736703215 -5.702150109 -6.545002672 -5.358857950
##  [876] -3.629583983 -5.050318218 -5.891088179 -5.531979618 -6.495399486
##  [881] -2.573271091 -3.143945252 -3.191921246 -5.519369602 -5.984584856
##  [886] -4.478325613 -5.088845244 -4.021654228 -3.698698790 -5.982458952
##  [891] -4.042580551 -4.300537423 -6.376320950 -3.334234767 -3.764277597
##  [896] -5.905958634 -3.833647875 -3.197726168 -3.819128542 -2.282832756
##  [901] -4.156189257 -5.572841583 -2.718432481 -3.619246224 -5.150347485
##  [906] -5.579327152 -1.889603436 -2.601241303 -4.991569613 -5.937325522
##  [911] -1.639333250 -3.483280413 -1.685884731 -1.092949168 -2.666935033
##  [916] -3.545706162 -2.912293901 -1.596214427 -2.475963538 -2.084492656
##  [921] -2.158983247 -0.539808416 -1.997089927 -1.158939943 -0.363830680
##  [926] -1.801662703 -0.660696844 -1.030825415 -2.453351557 -1.628388542
##  [931] -1.583055115  0.143862470  0.757885383  0.584210030 -0.672423168
##  [936]  0.140820158  1.179045676 -1.509427500 -0.798493552  0.926185276
##  [941] -1.181848297 -0.200570328  0.854026907  0.637950230 -0.031668852
##  [946]  1.120045785 -0.475955068 -0.775672998  1.023518825  0.398000050
##  [951]  1.210891718  1.375875204  0.970673465  0.465175832  2.192183180
##  [956]  1.437777321  2.387749009  2.187698120  2.794192844  0.751960815
##  [961]  3.119129797  4.025906703  2.461593504  2.243023706  2.182511311
##  [966]  1.682315270  2.517913600  2.493153059  3.370504735  1.688148079
##  [971]  1.853273538  4.744609953  6.015555568  3.169762035  4.138761495
##  [976]  2.301035997  3.406728728  0.444776142  4.277388389  5.982514743
##  [981]  3.706203893  3.371023535  3.354471635  2.403384888  3.441743209
##  [986]  4.258932853  2.897703128  4.506496678  3.490065395  5.413272411
##  [991]  5.119245346  1.364110524  3.793579206  4.944984606  3.776437403
##  [996]  2.357756642  6.043968234  5.805805088  6.535772398  5.416873092
```

```
plot(t_i,y_i,col='gray60')
```

##1번-(4)

```r
x<-x_1
y<-x_2
```
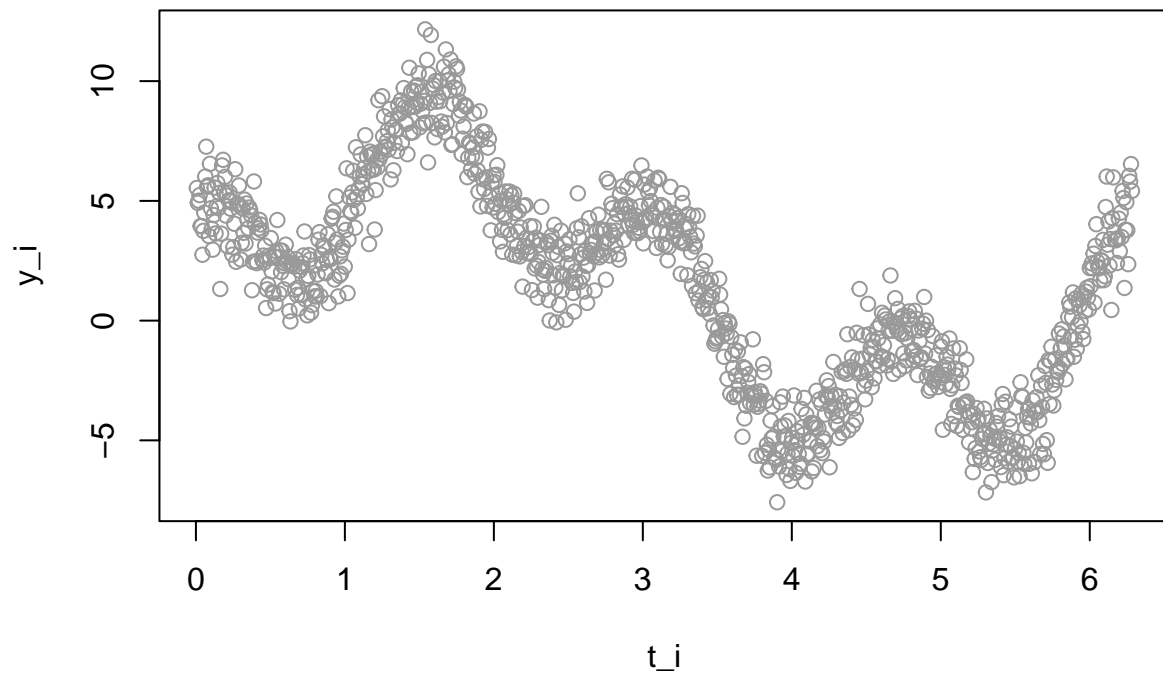
```r
A=cbind(1,x,y)
A
```

```
##                        x            y
##    [1,] 1  6.283144e-03  0.99968419
##    [2,] 1  1.256604e-02  0.99873696
##    [3,] 1  1.884844e-02  0.99715890
##    [4,] 1  2.513010e-02  0.99495102
##    [5,] 1  3.141076e-02  0.99211470
##    [6,] 1  3.769018e-02  0.98865174
##    [7,] 1  4.396812e-02  0.98456433
##    [8,] 1  5.024432e-02  0.97985505
##    [9,] 1  5.651853e-02  0.97452687
##   [10,] 1  6.279052e-02  0.96858316
##   [11,] 1  6.906003e-02  0.96202767
##   [12,] 1  7.532681e-02  0.95486454
##   [13,] 1  8.159061e-02  0.94709830
##   [14,] 1  8.785120e-02  0.93873386
```

```
##      [15,]  1  9.410831e-02  0.92977649
##      [16,]  1  1.003617e-01  0.92023185
##      [17,]  1  1.066112e-01  0.91010597
##      [18,]  1  1.128564e-01  0.89940525
##      [19,]  1  1.190972e-01  0.88813645
##      [20,]  1  1.253332e-01  0.87630668
##      [21,]  1  1.315644e-01  0.86392342
##      [22,]  1  1.377903e-01  0.85099448
##      [23,]  1  1.440108e-01  0.83752804
##      [24,]  1  1.502256e-01  0.82353260
##      [25,]  1  1.564345e-01  0.80901699
##      [26,]  1  1.626372e-01  0.79399040
##      [27,]  1  1.688334e-01  0.77846230
##      [28,]  1  1.750231e-01  0.76244251
##      [29,]  1  1.812058e-01  0.74594115
##      [30,]  1  1.873813e-01  0.72896863
##      [31,]  1  1.935495e-01  0.71153568
##      [32,]  1  1.997100e-01  0.69365331
##      [33,]  1  2.058626e-01  0.67533281
##      [34,]  1  2.120071e-01  0.65658576
##      [35,]  1  2.181432e-01  0.63742399
##      [36,]  1  2.242708e-01  0.61785961
##      [37,]  1  2.303894e-01  0.59790498
##      [38,]  1  2.364990e-01  0.57757270
##      [39,]  1  2.425992e-01  0.55687562
##      [40,]  1  2.486899e-01  0.53582679
##      [41,]  1  2.547707e-01  0.51443953
##      [42,]  1  2.608415e-01  0.49272734
##      [43,]  1  2.669020e-01  0.47070393
##      [44,]  1  2.729519e-01  0.44838322
##      [45,]  1  2.789911e-01  0.42577929
##      [46,]  1  2.850193e-01  0.40290644
##      [47,]  1  2.910362e-01  0.37977910
##      [48,]  1  2.970416e-01  0.35641188
##      [49,]  1  3.030353e-01  0.33281954
##      [50,]  1  3.090170e-01  0.30901699
##      [51,]  1  3.149865e-01  0.28501926
##      [52,]  1  3.209436e-01  0.26084151
##      [53,]  1  3.268880e-01  0.23649900
##      [54,]  1  3.328195e-01  0.21200711
##      [55,]  1  3.387379e-01  0.18738131
##      [56,]  1  3.446429e-01  0.16263717
##      [57,]  1  3.505343e-01  0.13779029
##      [58,]  1  3.564119e-01  0.11285638
##      [59,]  1  3.622754e-01  0.08785120
```

```
##    [60,] 1  3.681246e-01   0.06279052
##    [61,] 1  3.739592e-01   0.03769018
##    [62,] 1  3.797791e-01   0.01256604
##    [63,] 1  3.855840e-01  -0.01256604
##    [64,] 1  3.913737e-01  -0.03769018
##    [65,] 1  3.971479e-01  -0.06279052
##    [66,] 1  4.029064e-01  -0.08785120
##    [67,] 1  4.086491e-01  -0.11285638
##    [68,] 1  4.143756e-01  -0.13779029
##    [69,] 1  4.200857e-01  -0.16263717
##    [70,] 1  4.257793e-01  -0.18738131
##    [71,] 1  4.314560e-01  -0.21200711
##    [72,] 1  4.371158e-01  -0.23649900
##    [73,] 1  4.427582e-01  -0.26084151
##    [74,] 1  4.483832e-01  -0.28501926
##    [75,] 1  4.539905e-01  -0.30901699
##    [76,] 1  4.595799e-01  -0.33281954
##    [77,] 1  4.651511e-01  -0.35641188
##    [78,] 1  4.707039e-01  -0.37977910
##    [79,] 1  4.762382e-01  -0.40290644
##    [80,] 1  4.817537e-01  -0.42577929
##    [81,] 1  4.872501e-01  -0.44838322
##    [82,] 1  4.927273e-01  -0.47070393
##    [83,] 1  4.981851e-01  -0.49272734
##    [84,] 1  5.036232e-01  -0.51443953
##    [85,] 1  5.090414e-01  -0.53582679
##    [86,] 1  5.144395e-01  -0.55687562
##    [87,] 1  5.198173e-01  -0.57757270
##    [88,] 1  5.251746e-01  -0.59790498
##    [89,] 1  5.305112e-01  -0.61785961
##    [90,] 1  5.358268e-01  -0.63742399
##    [91,] 1  5.411213e-01  -0.65658576
##    [92,] 1  5.463943e-01  -0.67533281
##    [93,] 1  5.516459e-01  -0.69365331
##    [94,] 1  5.568756e-01  -0.71153568
##    [95,] 1  5.620834e-01  -0.72896863
##    [96,] 1  5.672689e-01  -0.74594115
##    [97,] 1  5.724321e-01  -0.76244251
##    [98,] 1  5.775727e-01  -0.77846230
##    [99,] 1  5.826905e-01  -0.79399040
##   [100,] 1  5.877853e-01  -0.80901699
##   [101,] 1  5.928568e-01  -0.82353260
##   [102,] 1  5.979050e-01  -0.83752804
##   [103,] 1  6.029295e-01  -0.85099448
##   [104,] 1  6.079303e-01  -0.86392342
```

```
## [105,] 1  6.129071e-01 -0.87630668
## [106,] 1  6.178596e-01 -0.88813645
## [107,] 1  6.227878e-01 -0.89940525
## [108,] 1  6.276914e-01 -0.91010597
## [109,] 1  6.325702e-01 -0.92023185
## [110,] 1  6.374240e-01 -0.92977649
## [111,] 1  6.422527e-01 -0.93873386
## [112,] 1  6.470560e-01 -0.94709830
## [113,] 1  6.518337e-01 -0.95486454
## [114,] 1  6.565858e-01 -0.96202767
## [115,] 1  6.613119e-01 -0.96858316
## [116,] 1  6.660119e-01 -0.97452687
## [117,] 1  6.706856e-01 -0.97985505
## [118,] 1  6.753328e-01 -0.98456433
## [119,] 1  6.799534e-01 -0.98865174
## [120,] 1  6.845471e-01 -0.99211470
## [121,] 1  6.891138e-01 -0.99495102
## [122,] 1  6.936533e-01 -0.99715890
## [123,] 1  6.981654e-01 -0.99873696
## [124,] 1  7.026500e-01 -0.99968419
## [125,] 1  7.071068e-01 -1.00000000
## [126,] 1  7.115357e-01 -0.99968419
## [127,] 1  7.159365e-01 -0.99873696
## [128,] 1  7.203090e-01 -0.99715890
## [129,] 1  7.246531e-01 -0.99495102
## [130,] 1  7.289686e-01 -0.99211470
## [131,] 1  7.332553e-01 -0.98865174
## [132,] 1  7.375131e-01 -0.98456433
## [133,] 1  7.417418e-01 -0.97985505
## [134,] 1  7.459411e-01 -0.97452687
## [135,] 1  7.501111e-01 -0.96858316
## [136,] 1  7.542514e-01 -0.96202767
## [137,] 1  7.583619e-01 -0.95486454
## [138,] 1  7.624425e-01 -0.94709830
## [139,] 1  7.664930e-01 -0.93873386
## [140,] 1  7.705132e-01 -0.92977649
## [141,] 1  7.745031e-01 -0.92023185
## [142,] 1  7.784623e-01 -0.91010597
## [143,] 1  7.823908e-01 -0.89940525
## [144,] 1  7.862884e-01 -0.88813645
## [145,] 1  7.901550e-01 -0.87630668
## [146,] 1  7.939904e-01 -0.86392342
## [147,] 1  7.977944e-01 -0.85099448
## [148,] 1  8.015670e-01 -0.83752804
## [149,] 1  8.053079e-01 -0.82353260
```

```
##   [150,] 1  8.090170e-01 -0.80901699
##   [151,] 1  8.126942e-01 -0.79399040
##   [152,] 1  8.163393e-01 -0.77846230
##   [153,] 1  8.199521e-01 -0.76244251
##   [154,] 1  8.235326e-01 -0.74594115
##   [155,] 1  8.270806e-01 -0.72896863
##   [156,] 1  8.305959e-01 -0.71153568
##   [157,] 1  8.340784e-01 -0.69365331
##   [158,] 1  8.375280e-01 -0.67533281
##   [159,] 1  8.409446e-01 -0.65658576
##   [160,] 1  8.443279e-01 -0.63742399
##   [161,] 1  8.476779e-01 -0.61785961
##   [162,] 1  8.509945e-01 -0.59790498
##   [163,] 1  8.542774e-01 -0.57757270
##   [164,] 1  8.575267e-01 -0.55687562
##   [165,] 1  8.607420e-01 -0.53582679
##   [166,] 1  8.639234e-01 -0.51443953
##   [167,] 1  8.670707e-01 -0.49272734
##   [168,] 1  8.701838e-01 -0.47070393
##   [169,] 1  8.732625e-01 -0.44838322
##   [170,] 1  8.763067e-01 -0.42577929
##   [171,] 1  8.793163e-01 -0.40290644
##   [172,] 1  8.822912e-01 -0.37977910
##   [173,] 1  8.852313e-01 -0.35641188
##   [174,] 1  8.881364e-01 -0.33281954
##   [175,] 1  8.910065e-01 -0.30901699
##   [176,] 1  8.938414e-01 -0.28501926
##   [177,] 1  8.966410e-01 -0.26084151
##   [178,] 1  8.994053e-01 -0.23649900
##   [179,] 1  9.021340e-01 -0.21200711
##   [180,] 1  9.048271e-01 -0.18738131
##   [181,] 1  9.074844e-01 -0.16263717
##   [182,] 1  9.101060e-01 -0.13779029
##   [183,] 1  9.126916e-01 -0.11285638
##   [184,] 1  9.152412e-01 -0.08785120
##   [185,] 1  9.177546e-01 -0.06279052
##   [186,] 1  9.202318e-01 -0.03769018
##   [187,] 1  9.226727e-01 -0.01256604
##   [188,] 1  9.250772e-01  0.01256604
##   [189,] 1  9.274452e-01  0.03769018
##   [190,] 1  9.297765e-01  0.06279052
##   [191,] 1  9.320711e-01  0.08785120
##   [192,] 1  9.343289e-01  0.11285638
##   [193,] 1  9.365499e-01  0.13779029
##   [194,] 1  9.387339e-01  0.16263717
```

```
## [195,] 1 9.408808e-01  0.18738131
## [196,] 1 9.429905e-01  0.21200711
## [197,] 1 9.450631e-01  0.23649900
## [198,] 1 9.470983e-01  0.26084151
## [199,] 1 9.490961e-01  0.28501926
## [200,] 1 9.510565e-01  0.30901699
## [201,] 1 9.529793e-01  0.33281954
## [202,] 1 9.548645e-01  0.35641188
## [203,] 1 9.567121e-01  0.37977910
## [204,] 1 9.585218e-01  0.40290644
## [205,] 1 9.602937e-01  0.42577929
## [206,] 1 9.620277e-01  0.44838322
## [207,] 1 9.637237e-01  0.47070393
## [208,] 1 9.653816e-01  0.49272734
## [209,] 1 9.670015e-01  0.51443953
## [210,] 1 9.685832e-01  0.53582679
## [211,] 1 9.701266e-01  0.55687562
## [212,] 1 9.716317e-01  0.57757270
## [213,] 1 9.730985e-01  0.59790498
## [214,] 1 9.745269e-01  0.61785961
## [215,] 1 9.759168e-01  0.63742399
## [216,] 1 9.772681e-01  0.65658576
## [217,] 1 9.785809e-01  0.67533281
## [218,] 1 9.798551e-01  0.69365331
## [219,] 1 9.810905e-01  0.71153568
## [220,] 1 9.822873e-01  0.72896863
## [221,] 1 9.834452e-01  0.74594115
## [222,] 1 9.845643e-01  0.76244251
## [223,] 1 9.856446e-01  0.77846230
## [224,] 1 9.866859e-01  0.79399040
## [225,] 1 9.876883e-01  0.80901699
## [226,] 1 9.886517e-01  0.82353260
## [227,] 1 9.895761e-01  0.83752804
## [228,] 1 9.904614e-01  0.85099448
## [229,] 1 9.913076e-01  0.86392342
## [230,] 1 9.921147e-01  0.87630668
## [231,] 1 9.928826e-01  0.88813645
## [232,] 1 9.936113e-01  0.89940525
## [233,] 1 9.943008e-01  0.91010597
## [234,] 1 9.949510e-01  0.92023185
## [235,] 1 9.955620e-01  0.92977649
## [236,] 1 9.961336e-01  0.93873386
## [237,] 1 9.966659e-01  0.94709830
## [238,] 1 9.971589e-01  0.95486454
## [239,] 1 9.976125e-01  0.96202767
```

```
## [240,] 1 9.980267e-01  0.96858316
## [241,] 1 9.984016e-01  0.97452687
## [242,] 1 9.987370e-01  0.97985505
## [243,] 1 9.990329e-01  0.98456433
## [244,] 1 9.992895e-01  0.98865174
## [245,] 1 9.995066e-01  0.99211470
## [246,] 1 9.996842e-01  0.99495102
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##    [608,] 1 -6.276914e-01 -0.91010597
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##   [937,] 1 -3.855840e-01 -0.01256604
##   [938,] 1 -3.797791e-01  0.01256604
##   [939,] 1 -3.739592e-01  0.03769018
##   [940,] 1 -3.681246e-01  0.06279052
##   [941,] 1 -3.622754e-01  0.08785120
##   [942,] 1 -3.564119e-01  0.11285638
##   [943,] 1 -3.505343e-01  0.13779029
##   [944,] 1 -3.446429e-01  0.16263717
##   [945,] 1 -3.387379e-01  0.18738131
##   [946,] 1 -3.328195e-01  0.21200711
##   [947,] 1 -3.268880e-01  0.23649900
##   [948,] 1 -3.209436e-01  0.26084151
##   [949,] 1 -3.149865e-01  0.28501926
##   [950,] 1 -3.090170e-01  0.30901699
##   [951,] 1 -3.030353e-01  0.33281954
##   [952,] 1 -2.970416e-01  0.35641188
##   [953,] 1 -2.910362e-01  0.37977910
##   [954,] 1 -2.850193e-01  0.40290644
##   [955,] 1 -2.789911e-01  0.42577929
##   [956,] 1 -2.729519e-01  0.44838322
##   [957,] 1 -2.669020e-01  0.47070393
##   [958,] 1 -2.608415e-01  0.49272734
##   [959,] 1 -2.547707e-01  0.51443953
```

```
##   [960,] 1 -2.486899e-01  0.53582679
##   [961,] 1 -2.425992e-01  0.55687562
##   [962,] 1 -2.364990e-01  0.57757270
##   [963,] 1 -2.303894e-01  0.59790498
##   [964,] 1 -2.242708e-01  0.61785961
##   [965,] 1 -2.181432e-01  0.63742399
##   [966,] 1 -2.120071e-01  0.65658576
##   [967,] 1 -2.058626e-01  0.67533281
##   [968,] 1 -1.997100e-01  0.69365331
##   [969,] 1 -1.935495e-01  0.71153568
##   [970,] 1 -1.873813e-01  0.72896863
##   [971,] 1 -1.812058e-01  0.74594115
##   [972,] 1 -1.750231e-01  0.76244251
##   [973,] 1 -1.688334e-01  0.77846230
##   [974,] 1 -1.626372e-01  0.79399040
##   [975,] 1 -1.564345e-01  0.80901699
##   [976,] 1 -1.502256e-01  0.82353260
##   [977,] 1 -1.440108e-01  0.83752804
##   [978,] 1 -1.377903e-01  0.85099448
##   [979,] 1 -1.315644e-01  0.86392342
##   [980,] 1 -1.253332e-01  0.87630668
##   [981,] 1 -1.190972e-01  0.88813645
##   [982,] 1 -1.128564e-01  0.89940525
##   [983,] 1 -1.066112e-01  0.91010597
##   [984,] 1 -1.003617e-01  0.92023185
##   [985,] 1 -9.410831e-02  0.92977649
##   [986,] 1 -8.785120e-02  0.93873386
##   [987,] 1 -8.159061e-02  0.94709830
##   [988,] 1 -7.532681e-02  0.95486454
##   [989,] 1 -6.906003e-02  0.96202767
##   [990,] 1 -6.279052e-02  0.96858316
##   [991,] 1 -5.651853e-02  0.97452687
##   [992,] 1 -5.024432e-02  0.97985505
##   [993,] 1 -4.396812e-02  0.98456433
##   [994,] 1 -3.769018e-02  0.98865174
##   [995,] 1 -3.141076e-02  0.99211470
##   [996,] 1 -2.513010e-02  0.99495102
##   [997,] 1 -1.884844e-02  0.99715890
##   [998,] 1 -1.256604e-02  0.99873696
##   [999,] 1 -6.283144e-03  0.99968419
## [1000,] 1 -2.449213e-16  1.00000000
```

##1번-(5)

```r
B=c(1.5,5,3)
dim(B)=c(3,1)
B
```

```
##      [,1]
## [1,]  1.5
## [2,]  5.0
## [3,]  3.0
```

```r
Y=A %*% B
Y
```

```
##                 [,1]
##     [1,]  4.53046829
##     [2,]  4.55904107
##     [3,]  4.58571890
##     [4,]  4.61050353
##     [5,]  4.63339790
##     [6,]  4.65440615
##     [7,]  4.67353360
##     [8,]  4.69078675
##     [9,]  4.70617329
##    [10,]  4.71970208
##    [11,]  4.73138314
##    [12,]  4.74122766
##    [13,]  4.74924797
##    [14,]  4.75545756
##    [15,]  4.75987102
##    [16,]  4.76250412
##    [17,]  4.76337368
##    [18,]  4.76249768
##    [19,]  4.75989515
##    [20,]  4.75558621
##    [21,]  4.74959205
##    [22,]  4.74193490
##    [23,]  4.73263803
##    [24,]  4.72172574
##    [25,]  4.70922331
##    [26,]  4.69515702
##    [27,]  4.67955413
##    [28,]  4.66244283
##    [29,]  4.64385225
##    [30,]  4.62381246
##    [31,]  4.60235437
##    [32,]  4.57950982
```

```
##      [33,]  4.55531147
##      [34,]  4.52979282
##      [35,]  4.50298818
##      [36,]  4.47493264
##      [37,]  4.44566208
##      [38,]  4.41521310
##      [39,]  4.38362300
##      [40,]  4.35092982
##      [41,]  4.31717223
##      [42,]  4.28238956
##      [43,]  4.24662174
##      [44,]  4.20990933
##      [45,]  4.17229340
##      [46,]  4.13381562
##      [47,]  4.09451812
##      [48,]  4.05444354
##      [49,]  4.01363498
##      [50,]  3.97213595
##      [51,]  3.92999039
##      [52,]  3.88724257
##      [53,]  3.84393714
##      [54,]  3.80011905
##      [55,]  3.75583354
##      [56,]  3.71112611
##      [57,]  3.66604247
##      [58,]  3.62062855
##      [59,]  3.57493042
##      [60,]  3.52899432
##      [61,]  3.48286658
##      [62,]  3.43659360
##      [63,]  3.39022184
##      [64,]  3.34379779
##      [65,]  3.29736789
##      [66,]  3.25097859
##      [67,]  3.20467622
##      [68,]  3.15850703
##      [69,]  3.11251715
##      [70,]  3.06675251
##      [71,]  3.02125890
##      [72,]  2.97608184
##      [73,]  2.93126664
##      [74,]  2.88685829
##      [75,]  2.84290152
##      [76,]  2.79944067
##      [77,]  2.75651975
```

```
##    [78,]   2.71418237
##    [79,]   2.67247171
##    [80,]   2.63143050
##    [81,]   2.59110098
##    [82,]   2.55152491
##    [83,]   2.51274350
##    [84,]   2.47479741
##    [85,]   2.43772669
##    [86,]   2.40157082
##    [87,]   2.36636860
##    [88,]   2.33215820
##    [89,]   2.29897708
##    [90,]   2.26686201
##    [91,]   2.23584899
##    [92,]   2.20597331
##    [93,]   2.17726944
##    [94,]   2.14977105
##    [95,]   2.12351101
##    [96,]   2.09852131
##    [97,]   2.07483309
##    [98,]   2.05247661
##    [99,]   2.03148120
##   [100,]   2.01187528
##   [101,]   1.99368631
##   [102,]   1.97694080
##   [103,]   1.96166426
##   [104,]   1.94788124
##   [105,]   1.93561523
##   [106,]   1.92488872
##   [107,]   1.91572315
##   [108,]   1.90813889
##   [109,]   1.90215527
##   [110,]   1.89779049
##   [111,]   1.89506169
##   [112,]   1.89398489
##   [113,]   1.89457499
##   [114,]   1.89684576
##   [115,]   1.90080984
##   [116,]   1.90647872
##   [117,]   1.91386273
##   [118,]   1.92297104
##   [119,]   1.93381166
##   [120,]   1.94639143
##   [121,]   1.96071599
##   [122,]   1.97678983
```

```
## [123,]  1.99461623
## [124,]  2.01419728
## [125,]  2.03553391
## [126,]  2.05862582
## [127,]  2.08347155
## [128,]  2.11006842
## [129,]  2.13841260
## [130,]  2.16849903
## [131,]  2.20032150
## [132,]  2.23387258
## [133,]  2.26914371
## [134,]  2.30612511
## [135,]  2.34480586
## [136,]  2.38517389
## [137,]  2.42721594
## [138,]  2.47091764
## [139,]  2.51626346
## [140,]  2.56323676
## [141,]  2.61181976
## [142,]  2.66199360
## [143,]  2.71373830
## [144,]  2.76703281
## [145,]  2.82185502
## [146,]  2.87818174
## [147,]  2.93598875
## [148,]  2.99525080
## [149,]  3.05594164
## [150,]  3.11803399
## [151,]  3.18149963
## [152,]  3.24630935
## [153,]  3.31243301
## [154,]  3.37983955
## [155,]  3.44849699
## [156,]  3.51837246
## [157,]  3.58943225
## [158,]  3.66164178
## [159,]  3.73496564
## [160,]  3.80936766
## [161,]  3.88481084
## [162,]  3.96125746
## [163,]  4.03866905
## [164,]  4.11700643
## [165,]  4.19622975
## [166,]  4.27629848
## [167,]  4.35717148
```

```
## [168,]  4.43880698
## [169,]  4.52116263
## [170,]  4.60419553
## [171,]  4.68786224
## [172,]  4.77211885
## [173,]  4.85692092
## [174,]  4.94222361
## [175,]  5.02798164
## [176,]  5.11414933
## [177,]  5.20068067
## [178,]  5.28752927
## [179,]  5.37464847
## [180,]  5.46199132
## [181,]  5.54951063
## [182,]  5.63715898
## [183,]  5.72488878
## [184,]  5.81265227
## [185,]  5.90040157
## [186,]  5.98808869
## [187,]  6.07566558
## [188,]  6.16308415
## [189,]  6.25029631
## [190,]  6.33725399
## [191,]  6.42390915
## [192,]  6.51021387
## [193,]  6.59612031
## [194,]  6.68158078
## [195,]  6.76654779
## [196,]  6.85097401
## [197,]  6.93481237
## [198,]  7.01801604
## [199,]  7.10053851
## [200,]  7.18233356
## [201,]  7.26335534
## [202,]  7.34355836
## [203,]  7.42289754
## [204,]  7.50132825
## [205,]  7.57880630
## [206,]  7.65528801
## [207,]  7.73073019
## [208,]  7.80509022
## [209,]  7.87832604
## [210,]  7.95039619
## [211,]  8.02125983
## [212,]  8.09087677
```

```
##   [213,]   8.15920750
##   [214,]   8.22621320
##   [215,]   8.29185578
##   [216,]   8.35609789
##   [217,]   8.41890295
##   [218,]   8.48023518
##   [219,]   8.54005962
##   [220,]   8.59834214
##   [221,]   8.65504946
##   [222,]   8.71014921
##   [223,]   8.76360988
##   [224,]   8.81540092
##   [225,]   8.86549269
##   [226,]   8.91385652
##   [227,]   8.96046471
##   [228,]   9.00529057
##   [229,]   9.04830841
##   [230,]   9.08949355
##   [231,]   9.12882237
##   [232,]   9.16627231
##   [233,]   9.20182186
##   [234,]   9.23545063
##   [235,]   9.26713928
##   [236,]   9.29686962
##   [237,]   9.32462456
##   [238,]   9.35038814
##   [239,]   9.37414555
##   [240,]   9.39588313
##   [241,]   9.41558837
##   [242,]   9.43324994
##   [243,]   9.44885768
##   [244,]   9.46240260
##   [245,]   9.47387691
##   [246,]   9.48327400
##   [247,]   9.49058846
##   [248,]   9.49581609
##   [249,]   9.49895387
##   [250,]   9.50000000
##   [251,]   9.49895387
##   [252,]   9.49581609
##   [253,]   9.49058846
##   [254,]   9.48327400
##   [255,]   9.47387691
##   [256,]   9.46240260
##   [257,]   9.44885768
```

```
## [258,]  9.43324994
## [259,]  9.41558837
## [260,]  9.39588313
## [261,]  9.37414555
## [262,]  9.35038814
## [263,]  9.32462456
## [264,]  9.29686962
## [265,]  9.26713928
## [266,]  9.23545063
## [267,]  9.20182186
## [268,]  9.16627231
## [269,]  9.12882237
## [270,]  9.08949355
## [271,]  9.04830841
## [272,]  9.00529057
## [273,]  8.96046471
## [274,]  8.91385652
## [275,]  8.86549269
## [276,]  8.81540092
## [277,]  8.76360988
## [278,]  8.71014921
## [279,]  8.65504946
## [280,]  8.59834214
## [281,]  8.54005962
## [282,]  8.48023518
## [283,]  8.41890295
## [284,]  8.35609789
## [285,]  8.29185578
## [286,]  8.22621320
## [287,]  8.15920750
## [288,]  8.09087677
## [289,]  8.02125983
## [290,]  7.95039619
## [291,]  7.87832604
## [292,]  7.80509022
## [293,]  7.73073019
## [294,]  7.65528801
## [295,]  7.57880630
## [296,]  7.50132825
## [297,]  7.42289754
## [298,]  7.34355836
## [299,]  7.26335534
## [300,]  7.18233356
## [301,]  7.10053851
## [302,]  7.01801604
```

```
## [303,]   6.93481237
## [304,]   6.85097401
## [305,]   6.76654779
## [306,]   6.68158078
## [307,]   6.59612031
## [308,]   6.51021387
## [309,]   6.42390915
## [310,]   6.33725399
## [311,]   6.25029631
## [312,]   6.16308415
## [313,]   6.07566558
## [314,]   5.98808869
## [315,]   5.90040157
## [316,]   5.81265227
## [317,]   5.72488878
## [318,]   5.63715898
## [319,]   5.54951063
## [320,]   5.46199132
## [321,]   5.37464847
## [322,]   5.28752927
## [323,]   5.20068067
## [324,]   5.11414933
## [325,]   5.02798164
## [326,]   4.94222361
## [327,]   4.85692092
## [328,]   4.77211885
## [329,]   4.68786224
## [330,]   4.60419553
## [331,]   4.52116263
## [332,]   4.43880698
## [333,]   4.35717148
## [334,]   4.27629848
## [335,]   4.19622975
## [336,]   4.11700643
## [337,]   4.03866905
## [338,]   3.96125746
## [339,]   3.88481084
## [340,]   3.80936766
## [341,]   3.73496564
## [342,]   3.66164178
## [343,]   3.58943225
## [344,]   3.51837246
## [345,]   3.44849699
## [346,]   3.37983955
## [347,]   3.31243301
```

```
## [348,]  3.24630935
## [349,]  3.18149963
## [350,]  3.11803399
## [351,]  3.05594164
## [352,]  2.99525080
## [353,]  2.93598875
## [354,]  2.87818174
## [355,]  2.82185502
## [356,]  2.76703281
## [357,]  2.71373830
## [358,]  2.66199360
## [359,]  2.61181976
## [360,]  2.56323676
## [361,]  2.51626346
## [362,]  2.47091764
## [363,]  2.42721594
## [364,]  2.38517389
## [365,]  2.34480586
## [366,]  2.30612511
## [367,]  2.26914371
## [368,]  2.23387258
## [369,]  2.20032150
## [370,]  2.16849903
## [371,]  2.13841260
## [372,]  2.11006842
## [373,]  2.08347155
## [374,]  2.05862582
## [375,]  2.03553391
## [376,]  2.01419728
## [377,]  1.99461623
## [378,]  1.97678983
## [379,]  1.96071599
## [380,]  1.94639143
## [381,]  1.93381166
## [382,]  1.92297104
## [383,]  1.91386273
## [384,]  1.90647872
## [385,]  1.90080984
## [386,]  1.89684576
## [387,]  1.89457499
## [388,]  1.89398489
## [389,]  1.89506169
## [390,]  1.89779049
## [391,]  1.90215527
## [392,]  1.90813889
```

```
##   [393,]   1.91572315
##   [394,]   1.92488872
##   [395,]   1.93561523
##   [396,]   1.94788124
##   [397,]   1.96166426
##   [398,]   1.97694080
##   [399,]   1.99368631
##   [400,]   2.01187528
##   [401,]   2.03148120
##   [402,]   2.05247661
##   [403,]   2.07483309
##   [404,]   2.09852131
##   [405,]   2.12351101
##   [406,]   2.14977105
##   [407,]   2.17726944
##   [408,]   2.20597331
##   [409,]   2.23584899
##   [410,]   2.26686201
##   [411,]   2.29897708
##   [412,]   2.33215820
##   [413,]   2.36636860
##   [414,]   2.40157082
##   [415,]   2.43772669
##   [416,]   2.47479741
##   [417,]   2.51274350
##   [418,]   2.55152491
##   [419,]   2.59110098
##   [420,]   2.63143050
##   [421,]   2.67247171
##   [422,]   2.71418237
##   [423,]   2.75651975
##   [424,]   2.79944067
##   [425,]   2.84290152
##   [426,]   2.88685829
##   [427,]   2.93126664
##   [428,]   2.97608184
##   [429,]   3.02125890
##   [430,]   3.06675251
##   [431,]   3.11251715
##   [432,]   3.15850703
##   [433,]   3.20467622
##   [434,]   3.25097859
##   [435,]   3.29736789
##   [436,]   3.34379779
##   [437,]   3.39022184
```

```
## [438,]  3.43659360
## [439,]  3.48286658
## [440,]  3.52899432
## [441,]  3.57493042
## [442,]  3.62062855
## [443,]  3.66604247
## [444,]  3.71112611
## [445,]  3.75583354
## [446,]  3.80011905
## [447,]  3.84393714
## [448,]  3.88724257
## [449,]  3.92999039
## [450,]  3.97213595
## [451,]  4.01363498
## [452,]  4.05444354
## [453,]  4.09451812
## [454,]  4.13381562
## [455,]  4.17229340
## [456,]  4.20990933
## [457,]  4.24662174
## [458,]  4.28238956
## [459,]  4.31717223
## [460,]  4.35092982
## [461,]  4.38362300
## [462,]  4.41521310
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## [464,]  4.47493264
## [465,]  4.50298818
## [466,]  4.52979282
## [467,]  4.55531147
## [468,]  4.57950982
## [469,]  4.60235437
## [470,]  4.62381246
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## [473,]  4.67955413
## [474,]  4.69515702
## [475,]  4.70922331
## [476,]  4.72172574
## [477,]  4.73263803
## [478,]  4.74193490
## [479,]  4.74959205
## [480,]  4.75558621
## [481,]  4.75989515
## [482,]  4.76249768
```

```
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## [484,]  4.76250412
## [485,]  4.75987102
## [486,]  4.75545756
## [487,]  4.74924797
## [488,]  4.74122766
## [489,]  4.73138314
## [490,]  4.71970208
## [491,]  4.70617329
## [492,]  4.69078675
## [493,]  4.67353360
## [494,]  4.65440615
## [495,]  4.63339790
## [496,]  4.61050353
## [497,]  4.58571890
## [498,]  4.55904107
## [499,]  4.53046829
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## [502,]  4.43338067
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## [506,]  4.27750432
## [507,]  4.23385241
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## [509,]  4.14098795
## [510,]  4.09179689
## [511,]  4.04078289
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## [514,]  3.87694559
## [515,]  3.81878789
## [516,]  3.75888697
## [517,]  3.69726214
## [518,]  3.63393383
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## [521,]  3.43394846
## [522,]  3.36403199
## [523,]  3.29253021
## [524,]  3.21946985
## [525,]  3.14487866
## [526,]  3.06878537
## [527,]  2.99121968
```

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## [529,]  2.83179462
## [530,]  2.74999931
## [531,]  2.66685969
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## [533,]  2.49668538
## [534,]  2.40972172
## [535,]  2.32155576
## [536,]  2.23222503
## [537,]  2.14176782
## [538,]  2.05022313
## [539,]  1.95763070
## [540,]  1.86403095
## [541,]  1.76946497
## [542,]  1.67397449
## [543,]  1.57760185
## [544,]  1.48038997
## [545,]  1.38238234
## [546,]  1.28362299
## [547,]  1.18415645
## [548,]  1.08402773
## [549,]  0.98328229
## [550,]  0.88196601
## [551,]  0.78012519
## [552,]  0.67780647
## [553,]  0.57505684
## [554,]  0.47192361
## [555,]  0.36845434
## [556,]  0.26469688
## [557,]  0.16069927
## [558,]  0.05650976
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## [560,] -0.15225120
## [561,] -0.25672548
## [562,] -0.36119736
## [563,] -0.46561808
## [564,] -0.56993888
## [565,] -0.67411101
## [566,] -0.77808577
## [567,] -0.88181453
## [568,] -0.98524878
## [569,] -1.08834014
## [570,] -1.19104040
## [571,] -1.29330156
## [572,] -1.39507582
```

```
## [573,] -1.49631567
## [574,] -1.59697387
## [575,] -1.69700348
## [576,] -1.79635794
## [577,] -1.89499103
## [578,] -1.99285695
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## [580,] -2.18610625
## [581,] -2.28140028
## [582,] -2.37574850
## [583,] -2.46910755
## [584,] -2.56143461
## [585,] -2.65268746
## [586,] -2.74282452
## [587,] -2.83180482
## [588,] -2.91958810
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## [590,] -3.09140594
## [591,] -3.17536353
## [592,] -3.25797016
## [593,] -3.33918927
## [594,] -3.41898511
## [595,] -3.49732277
## [596,] -3.57416818
## [597,] -3.64948816
## [598,] -3.72325042
## [599,] -3.79542359
## [600,] -3.86597724
## [601,] -3.93488189
## [602,] -4.00210904
## [603,] -4.06763115
## [604,] -4.13142174
## [605,] -4.19345531
## [606,] -4.25370741
## [607,] -4.31215466
## [608,] -4.36877472
## [609,] -4.42354635
## [610,] -4.47644941
## [611,] -4.52746484
## [612,] -4.57657472
## [613,] -4.62376226
## [614,] -4.66901179
## [615,] -4.71230881
## [616,] -4.75363996
## [617,] -4.79299304
```

```
##   [618,] -4.83035704
##   [619,] -4.86572213
##   [620,] -4.89907963
##   [621,] -4.93042209
##   [622,] -4.95974323
##   [623,] -4.98703796
##   [624,] -5.01230242
##   [625,] -5.03553391
##   [626,] -5.05673095
##   [627,] -5.07589328
##   [628,] -5.09302183
##   [629,] -5.10811870
##   [630,] -5.12118724
##   [631,] -5.13223197
##   [632,] -5.14125859
##   [633,] -5.14827402
##   [634,] -5.15328635
##   [635,] -5.15630483
##   [636,] -5.15733992
##   [637,] -5.15640321
##   [638,] -5.15350747
##   [639,] -5.14866661
##   [640,] -5.14189567
##   [641,] -5.13321084
##   [642,] -5.12262942
##   [643,] -5.11016981
##   [644,] -5.09585151
##   [645,] -5.07969510
##   [646,] -5.06172224
##   [647,] -5.04195564
##   [648,] -5.02041904
##   [649,] -4.99713722
##   [650,] -4.97213595
##   [651,] -4.94544202
##   [652,] -4.91708316
##   [653,] -4.88708808
##   [654,] -4.85548642
##   [655,] -4.82230875
##   [656,] -4.78758653
##   [657,] -4.75135209
##   [658,] -4.71363862
##   [659,] -4.67448018
##   [660,] -4.63391160
##   [661,] -4.59196852
##   [662,] -4.54868736
```

```
## [663,] -4.50410527
## [664,] -4.45826013
## [665,] -4.41119052
## [666,] -4.36293569
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## [668,] -4.26303057
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## [670,] -4.15887127
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## [681,] -3.52533362
## [682,] -3.46390073
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## [684,] -3.33975945
## [685,] -3.27714469
## [686,] -3.21422978
## [687,] -3.15106182
## [688,] -3.08768791
## [689,] -3.02415522
## [690,] -2.96051087
## [691,] -2.89680197
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## [693,] -2.76937856
## [694,] -2.70575779
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## [698,] -2.45296701
## [699,] -2.39042294
## [700,] -2.32823160
## [701,] -2.26643807
## [702,] -2.20508709
## [703,] -2.14422297
## [704,] -2.08388964
## [705,] -2.02413055
## [706,] -1.96498871
## [707,] -1.90650659
```

```
##    [708,] -1.84872617
##    [709,] -1.79168884
##    [710,] -1.73543542
##    [711,] -1.68000613
##    [712,] -1.62544055
##    [713,] -1.57177761
##    [714,] -1.51905552
##    [715,] -1.46731184
##    [716,] -1.41658335
##    [717,] -1.36690610
##    [718,] -1.31831534
##    [719,] -1.27084556
##    [720,] -1.22453037
##    [721,] -1.17940259
##    [722,] -1.13549414
##    [723,] -1.09283607
##    [724,] -1.05145853
##    [725,] -1.01139072
##    [726,] -0.97266093
##    [727,] -0.93529647
##    [728,] -0.89932368
##    [729,] -0.86476790
##    [730,] -0.83165347
##    [731,] -0.80000368
##    [732,] -0.76984080
##    [733,] -0.74118604
##    [734,] -0.71405954
##    [735,] -0.68848037
##    [736,] -0.66446647
##    [737,] -0.64203473
##    [738,] -0.62120087
##    [739,] -0.60197952
##    [740,] -0.58438416
##    [741,] -0.56842713
##    [742,] -0.55411963
##    [743,] -0.54147167
##    [744,] -0.53049213
##    [745,] -0.52118870
##    [746,] -0.51356790
##    [747,] -0.50763506
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##    [751,] -0.50084874
##    [752,] -0.50339435
```

```
##    [753,] -0.50763506
##    [754,] -0.51356790
##    [755,] -0.52118870
##    [756,] -0.53049213
##    [757,] -0.54147167
##    [758,] -0.55411963
##    [759,] -0.56842713
##    [760,] -0.58438416
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##    [762,] -0.62120087
##    [763,] -0.64203473
##    [764,] -0.66446647
##    [765,] -0.68848037
##    [766,] -0.71405954
##    [767,] -0.74118604
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##    [769,] -0.80000368
##    [770,] -0.83165347
##    [771,] -0.86476790
##    [772,] -0.89932368
##    [773,] -0.93529647
##    [774,] -0.97266093
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##    [777,] -1.09283607
##    [778,] -1.13549414
##    [779,] -1.17940259
##    [780,] -1.22453037
##    [781,] -1.27084556
##    [782,] -1.31831534
##    [783,] -1.36690610
##    [784,] -1.41658335
##    [785,] -1.46731184
##    [786,] -1.51905552
##    [787,] -1.57177761
##    [788,] -1.62544055
##    [789,] -1.68000613
##    [790,] -1.73543542
##    [791,] -1.79168884
##    [792,] -1.84872617
##    [793,] -1.90650659
##    [794,] -1.96498871
##    [795,] -2.02413055
##    [796,] -2.08388964
##    [797,] -2.14422297
```

```
## [798,] -2.20508709
## [799,] -2.26643807
## [800,] -2.32823160
## [801,] -2.39042294
## [802,] -2.45296701
## [803,] -2.51581838
## [804,] -2.57893135
## [805,] -2.64225990
## [806,] -2.70575779
## [807,] -2.76937856
## [808,] -2.83307556
## [809,] -2.89680197
## [810,] -2.96051087
## [811,] -3.02415522
## [812,] -3.08768791
## [813,] -3.15106182
## [814,] -3.21422978
## [815,] -3.27714469
## [816,] -3.33975945
## [817,] -3.40202709
## [818,] -3.46390073
## [819,] -3.52533362
## [820,] -3.58627921
## [821,] -3.64669113
## [822,] -3.70652325
## [823,] -3.76572970
## [824,] -3.82426491
## [825,] -3.88208360
## [826,] -3.93914088
## [827,] -3.99539219
## [828,] -4.05079342
## [829,] -4.10530086
## [830,] -4.15887127
## [831,] -4.21146192
## [832,] -4.26303057
## [833,] -4.31353553
## [834,] -4.36293569
## [835,] -4.41119052
## [836,] -4.45826013
## [837,] -4.50410527
## [838,] -4.54868736
## [839,] -4.59196852
## [840,] -4.63391160
## [841,] -4.67448018
## [842,] -4.71363862
```

```
## [843,] -4.75135209
## [844,] -4.78758653
## [845,] -4.82230875
## [846,] -4.85548642
## [847,] -4.88708808
## [848,] -4.91708316
## [849,] -4.94544202
## [850,] -4.97213595
## [851,] -4.99713722
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## [853,] -5.04195564
## [854,] -5.06172224
## [855,] -5.07969510
## [856,] -5.09585151
## [857,] -5.11016981
## [858,] -5.12262942
## [859,] -5.13321084
## [860,] -5.14189567
## [861,] -5.14866661
## [862,] -5.15350747
## [863,] -5.15640321
## [864,] -5.15733992
## [865,] -5.15630483
## [866,] -5.15328635
## [867,] -5.14827402
## [868,] -5.14125859
## [869,] -5.13223197
## [870,] -5.12118724
## [871,] -5.10811870
## [872,] -5.09302183
## [873,] -5.07589328
## [874,] -5.05673095
## [875,] -5.03553391
## [876,] -5.01230242
## [877,] -4.98703796
## [878,] -4.95974323
## [879,] -4.93042209
## [880,] -4.89907963
## [881,] -4.86572213
## [882,] -4.83035704
## [883,] -4.79299304
## [884,] -4.75363996
## [885,] -4.71230881
## [886,] -4.66901179
## [887,] -4.62376226
```

```
##   [888,] -4.57657472
##   [889,] -4.52746484
##   [890,] -4.47644941
##   [891,] -4.42354635
##   [892,] -4.36877472
##   [893,] -4.31215466
##   [894,] -4.25370741
##   [895,] -4.19345531
##   [896,] -4.13142174
##   [897,] -4.06763115
##   [898,] -4.00210904
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##   [900,] -3.86597724
##   [901,] -3.79542359
##   [902,] -3.72325042
##   [903,] -3.64948816
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##   [905,] -3.49732277
##   [906,] -3.41898511
##   [907,] -3.33918927
##   [908,] -3.25797016
##   [909,] -3.17536353
##   [910,] -3.09140594
##   [911,] -3.00613476
##   [912,] -2.91958810
##   [913,] -2.83180482
##   [914,] -2.74282452
##   [915,] -2.65268746
##   [916,] -2.56143461
##   [917,] -2.46910755
##   [918,] -2.37574850
##   [919,] -2.28140028
##   [920,] -2.18610625
##   [921,] -2.08991033
##   [922,] -1.99285695
##   [923,] -1.89499103
##   [924,] -1.79635794
##   [925,] -1.69700348
##   [926,] -1.59697387
##   [927,] -1.49631567
##   [928,] -1.39507582
##   [929,] -1.29330156
##   [930,] -1.19104040
##   [931,] -1.08834014
##   [932,] -0.98524878
```

```
##   [933,] -0.88181453
##   [934,] -0.77808577
##   [935,] -0.67411101
##   [936,] -0.56993888
##   [937,] -0.46561808
##   [938,] -0.36119736
##   [939,] -0.25672548
##   [940,] -0.15225120
##   [941,] -0.04782324
##   [942,]  0.05650976
##   [943,]  0.16069927
##   [944,]  0.26469688
##   [945,]  0.36845434
##   [946,]  0.47192361
##   [947,]  0.57505684
##   [948,]  0.67780647
##   [949,]  0.78012519
##   [950,]  0.88196601
##   [951,]  0.98328229
##   [952,]  1.08402773
##   [953,]  1.18415645
##   [954,]  1.28362299
##   [955,]  1.38238234
##   [956,]  1.48038997
##   [957,]  1.57760185
##   [958,]  1.67397449
##   [959,]  1.76946497
##   [960,]  1.86403095
##   [961,]  1.95763070
##   [962,]  2.05022313
##   [963,]  2.14176782
##   [964,]  2.23222503
##   [965,]  2.32155576
##   [966,]  2.40972172
##   [967,]  2.49668538
##   [968,]  2.58241001
##   [969,]  2.66685969
##   [970,]  2.74999931
##   [971,]  2.83179462
##   [972,]  2.91221224
##   [973,]  2.99121968
##   [974,]  3.06878537
##   [975,]  3.14487866
##   [976,]  3.21946985
##   [977,]  3.29253021
```

```
##  [978,]   3.36403199
##  [979,]   3.43394846
##  [980,]   3.50225387
##  [981,]   3.56892355
##  [982,]   3.63393383
##  [983,]   3.69726214
##  [984,]   3.75888697
##  [985,]   3.81878789
##  [986,]   3.87694559
##  [987,]   3.93334186
##  [988,]   3.98795961
##  [989,]   4.04078289
##  [990,]   4.09179689
##  [991,]   4.14098795
##  [992,]   4.18834357
##  [993,]   4.23385241
##  [994,]   4.27750432
##  [995,]   4.31929031
##  [996,]   4.35920257
##  [997,]   4.39723450
##  [998,]   4.43338067
##  [999,]   4.46763685
## [1000,]   4.50000000
```

```
plot(t_i,y_i,col='gray60')
lines(t_i,Y,col='red')
```
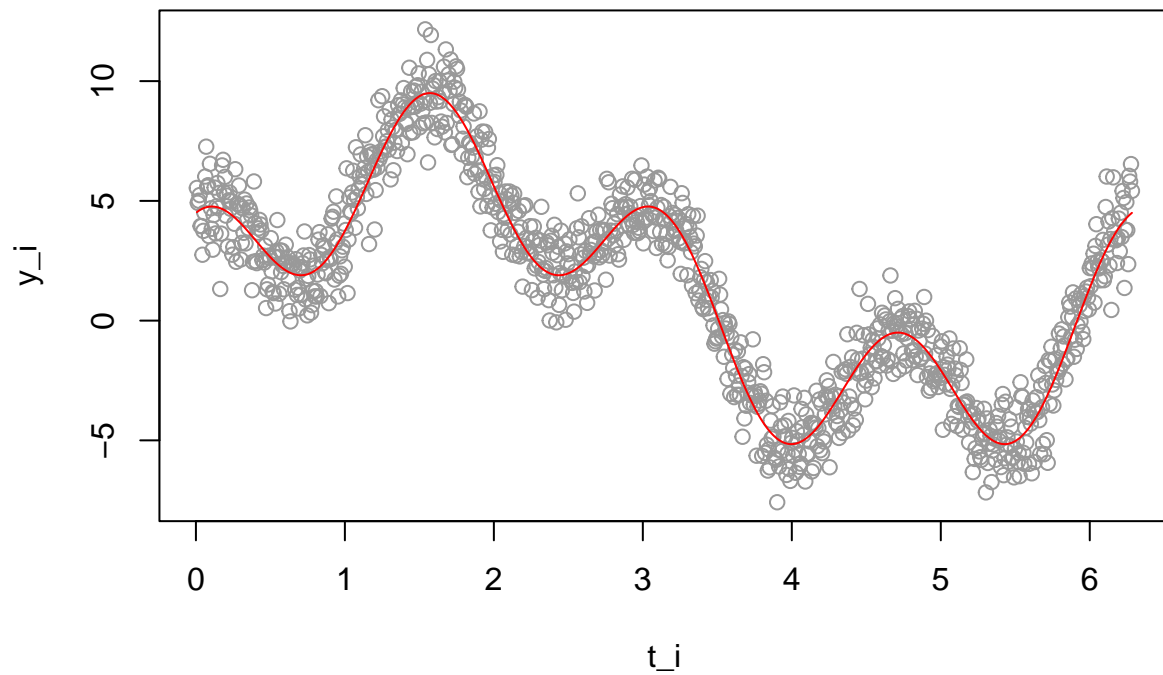
##1번-(6)

```
x<-x_1
z<-x_2
X=cbind(1,x,z)
```

```
i=1:1000
y=c(y_i)
dim(y)=c(1000,1)
y
```

```
##                  [,1]
##    [1,]  5.539558031
##    [2,]  4.919816676
##    [3,]  5.007806262
##    [4,]  5.239767743
##    [5,]  3.949296552
##    [6,]  3.947357134
##    [7,]  2.751719554
##    [8,]  3.746742127
##    [9,]  4.507076273
##   [10,]  6.016023301
##   [11,]  7.263156605
```

```
##      [12,]   5.588686040
##      [13,]   5.653084122
##      [14,]   3.530681889
##      [15,]   6.548678230
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##   [593,] -3.084735674
##   [594,] -3.134286187
##   [595,] -0.780917445
##   [596,] -3.511589275
```

```
## [597,] -2.990630842
## [598,] -3.149578038
## [599,] -5.641098888
## [600,] -3.597638100
## [601,] -3.477589290
## [602,] -3.337455083
## [603,] -2.949769790
## [604,] -3.051179196
## [605,] -5.650434801
## [606,] -1.819917602
## [607,] -2.155306147
## [608,] -5.522013881
## [609,] -3.348914209
## [610,] -5.183758038
## [611,] -6.260869040
## [612,] -5.376754314
## [613,] -6.128388397
## [614,] -4.174268917
## [615,] -4.919996891
## [616,] -3.571476766
## [617,] -4.840670374
## [618,] -5.725314601
## [619,] -5.755467921
## [620,] -5.815423905
## [621,] -7.583896733
## [622,] -5.387021560
## [623,] -6.089829181
## [624,] -3.413168905
## [625,] -4.414104017
## [626,] -5.448136064
## [627,] -3.171811207
## [628,] -4.842864982
## [629,] -4.376314264
## [630,] -4.829297114
## [631,] -6.444318833
## [632,] -5.550404272
## [633,] -4.187825420
## [634,] -6.197191418
## [635,] -6.692534504
## [636,] -5.100942448
## [637,] -4.898457623
## [638,] -5.652979974
## [639,] -3.124613607
## [640,] -5.409366276
## [641,] -6.356375768
```

```
## [642,] -4.619002853
## [643,] -5.012916862
## [644,] -5.565885073
## [645,] -6.107780113
## [646,] -5.970689940
## [647,] -3.688653268
## [648,] -4.450460764
## [649,] -4.767670643
## [650,] -3.225545977
## [651,] -6.717934766
## [652,] -3.912586194
## [653,] -5.561106191
## [654,] -5.574327214
## [655,] -5.010073062
## [656,] -5.049020043
## [657,] -4.275472600
## [658,] -6.298157814
## [659,] -4.290819838
## [660,] -6.154321611
## [661,] -4.306174371
## [662,] -4.464525542
## [663,] -2.929412578
## [664,] -5.244522308
## [665,] -4.489561642
## [666,] -3.296558099
## [667,] -5.410827425
## [668,] -3.460187799
## [669,] -5.532253013
## [670,] -4.894795281
## [671,] -5.052234809
## [672,] -3.919761208
## [673,] -3.151938838
## [674,] -2.492599061
## [675,] -3.203330367
## [676,] -2.732979076
## [677,] -6.123503402
## [678,] -3.571123836
## [679,] -3.160358735
## [680,] -3.842609822
## [681,] -1.724926357
## [682,] -3.578650588
## [683,] -3.097223259
## [684,] -4.265006836
## [685,] -3.983363785
## [686,] -4.376487481
```

```
##   [687,] -4.898370301
##   [688,] -3.157352155
##   [689,] -3.739292687
##   [690,] -2.142588850
##   [691,] -4.692158382
##   [692,] -3.418828227
##   [693,] -2.123225698
##   [694,] -2.032997823
##   [695,] -2.222226085
##   [696,] -0.568696935
##   [697,] -4.583497933
##   [698,] -3.169258668
##   [699,] -1.933120031
##   [700,] -3.515977113
##   [701,] -1.533782851
##   [702,] -4.371928592
##   [703,] -3.674352766
##   [704,] -2.040332354
##   [705,] -4.144474735
##   [706,] -0.509189512
##   [707,] -1.625271390
##   [708,] -2.219607557
##   [709,]  1.321647736
##   [710,] -2.139869323
##   [711,] -2.185029913
##   [712,] -1.589707713
##   [713,] -0.607605390
##   [714,] -2.708702375
##   [715,] -3.285963498
##   [716,] -2.504544538
##   [717,] -2.079439042
##   [718,]  0.698878672
##   [719,] -0.574466359
##   [720,] -1.419174979
##   [721,] -1.139250758
##   [722,] -2.779034844
##   [723,] -0.799729582
##   [724,] -1.101883350
##   [725,] -2.412025144
##   [726,] -1.690549208
##   [727,] -1.703551709
##   [728,] -0.323682852
##   [729,] -0.748016938
##   [730,] -1.886620404
##   [731,] -0.159428476
```

```
##    [732,] -1.481470087
##    [733,]  0.328454264
##    [734,] -1.532669132
##    [735,] -1.023972422
##    [736,]  0.213529871
##    [737,]  0.048813938
##    [738,] -1.877998437
##    [739,] -1.607506356
##    [740,] -0.424036178
##    [741,] -0.031508158
##    [742,]  1.884890584
##    [743,] -1.700499286
##    [744,] -0.421792254
##    [745,] -2.226350643
##    [746,] -0.109163120
##    [747,]  0.938615811
##    [748,] -0.239386282
##    [749,] -0.383013551
##    [750,]  0.489984188
##    [751,] -2.053577539
##    [752,] -0.490494933
##    [753,]  0.089152886
##    [754,] -0.566482071
##    [755,]  0.190172005
##    [756,] -1.370090775
##    [757,] -1.911393591
##    [758,] -0.525957674
##    [759,] -1.664478910
##    [760,] -0.746740493
##    [761,]  0.190440669
##    [762,]  0.384913383
##    [763,]  0.067852114
##    [764,] -0.345507181
##    [765,] -1.248150514
##    [766,] -1.652043264
##    [767,] -1.229289008
##    [768,]  0.407969970
##    [769,] -1.492419983
##    [770,]  0.075277959
##    [771,] -2.273569512
##    [772,] -0.414334634
##    [773,] -0.851791688
##    [774,] -1.605026160
##    [775,] -1.537713752
##    [776,] -0.333752415
```

```
##   [777,] -0.131222574
##   [778,]  0.987944312
##   [779,] -1.375957946
##   [780,] -0.002942164
##   [781,] -2.354539570
##   [782,] -0.395317994
##   [783,] -2.929255204
##   [784,] -2.205652313
##   [785,] -2.814009429
##   [786,] -1.928622837
##   [787,] -0.639731093
##   [788,] -2.532911230
##   [789,] -2.447937883
##   [790,] -2.234567852
##   [791,] -1.447857216
##   [792,] -2.193627307
##   [793,] -2.771100125
##   [794,] -2.288652086
##   [795,] -2.399153634
##   [796,] -1.086193099
##   [797,] -0.863225649
##   [798,] -4.559351200
##   [799,] -1.946435103
##   [800,] -2.264985858
##   [801,] -2.664190517
##   [802,] -1.502902917
##   [803,] -1.836393906
##   [804,] -2.004610992
##   [805,] -0.745377063
##   [806,] -2.851424497
##   [807,] -4.313112327
##   [808,] -2.705347631
##   [809,] -1.163504373
##   [810,] -3.989127213
##   [811,] -2.005268995
##   [812,] -2.286509253
##   [813,] -4.400464432
##   [814,] -3.557476350
##   [815,] -3.605485889
##   [816,] -1.154449253
##   [817,] -2.058896547
##   [818,] -2.604308960
##   [819,] -4.555866609
##   [820,] -3.516239752
##   [821,] -3.502409260
```

```
##   [822,] -3.421586456
##   [823,] -1.621518996
##   [824,] -3.376353867
##   [825,] -3.809910717
##   [826,] -5.089639286
##   [827,] -3.947776991
##   [828,] -4.499867478
##   [829,] -4.243982554
##   [830,] -6.326743687
##   [831,] -3.889076331
##   [832,] -5.775901325
##   [833,] -5.327291685
##   [834,] -3.649729856
##   [835,] -4.177672614
##   [836,] -4.089621111
##   [837,] -5.462252138
##   [838,] -5.704995214
##   [839,] -5.819802868
##   [840,] -4.937218028
##   [841,] -4.747065496
##   [842,] -3.682561350
##   [843,] -4.705939442
##   [844,] -7.173389136
##   [845,] -4.084283766
##   [846,] -5.943905400
##   [847,] -5.138585323
##   [848,] -4.559397031
##   [849,] -4.817071893
##   [850,] -6.741958823
##   [851,] -5.424690809
##   [852,] -5.172253059
##   [853,] -4.929719743
##   [854,] -5.814864529
##   [855,] -4.276100628
##   [856,] -4.429667113
##   [857,] -3.983432735
##   [858,] -5.016250233
##   [859,] -4.901805762
##   [860,] -6.115848358
##   [861,] -3.506669880
##   [862,] -3.064259213
##   [863,] -6.454309339
##   [864,] -5.748635252
##   [865,] -3.386271325
##   [866,] -5.179628107
```

```
## [867,] -4.874021569
## [868,] -5.897819681
## [869,] -4.118141509
## [870,] -5.227477049
## [871,] -4.426454084
## [872,] -5.736703215
## [873,] -5.702150109
## [874,] -6.545002672
## [875,] -5.358857950
## [876,] -3.629583983
## [877,] -5.050318218
## [878,] -5.891088179
## [879,] -5.531979618
## [880,] -6.495399486
## [881,] -2.573271091
## [882,] -3.143945252
## [883,] -3.191921246
## [884,] -5.519369602
## [885,] -5.984584856
## [886,] -4.478325613
## [887,] -5.088845244
## [888,] -4.021654228
## [889,] -3.698698790
## [890,] -5.982458952
## [891,] -4.042580551
## [892,] -4.300537423
## [893,] -6.376320950
## [894,] -3.334234767
## [895,] -3.764277597
## [896,] -5.905958634
## [897,] -3.833647875
## [898,] -3.197726168
## [899,] -3.819128542
## [900,] -2.282832756
## [901,] -4.156189257
## [902,] -5.572841583
## [903,] -2.718432481
## [904,] -3.619246224
## [905,] -5.150347485
## [906,] -5.579327152
## [907,] -1.889603436
## [908,] -2.601241303
## [909,] -4.991569613
## [910,] -5.937325522
## [911,] -1.639333250
```

```
##   [912,] -3.483280413
##   [913,] -1.685884731
##   [914,] -1.092949168
##   [915,] -2.666935033
##   [916,] -3.545706162
##   [917,] -2.912293901
##   [918,] -1.596214427
##   [919,] -2.475963538
##   [920,] -2.084492656
##   [921,] -2.158983247
##   [922,] -0.539808416
##   [923,] -1.997089927
##   [924,] -1.158939943
##   [925,] -0.363830680
##   [926,] -1.801662703
##   [927,] -0.660696844
##   [928,] -1.030825415
##   [929,] -2.453351557
##   [930,] -1.628388542
##   [931,] -1.583055115
##   [932,]  0.143862470
##   [933,]  0.757885383
##   [934,]  0.584210030
##   [935,] -0.672423168
##   [936,]  0.140820158
##   [937,]  1.179045676
##   [938,] -1.509427500
##   [939,] -0.798493552
##   [940,]  0.926185276
##   [941,] -1.181848297
##   [942,] -0.200570328
##   [943,]  0.854026907
##   [944,]  0.637950230
##   [945,] -0.031668852
##   [946,]  1.120045785
##   [947,] -0.475955068
##   [948,] -0.775672998
##   [949,]  1.023518825
##   [950,]  0.398000050
##   [951,]  1.210891718
##   [952,]  1.375875204
##   [953,]  0.970673465
##   [954,]  0.465175832
##   [955,]  2.192183180
##   [956,]  1.437777321
```

```
##   [957,]  2.387749009
##   [958,]  2.187698120
##   [959,]  2.794192844
##   [960,]  0.751960815
##   [961,]  3.119129797
##   [962,]  4.025906703
##   [963,]  2.461593504
##   [964,]  2.243023706
##   [965,]  2.182511311
##   [966,]  1.682315270
##   [967,]  2.517913600
##   [968,]  2.493153059
##   [969,]  3.370504735
##   [970,]  1.688148079
##   [971,]  1.853273538
##   [972,]  4.744609953
##   [973,]  6.015555568
##   [974,]  3.169762035
##   [975,]  4.138761495
##   [976,]  2.301035997
##   [977,]  3.406728728
##   [978,]  0.444776142
##   [979,]  4.277388389
##   [980,]  5.982514743
##   [981,]  3.706203893
##   [982,]  3.371023535
##   [983,]  3.354471635
##   [984,]  2.403384888
##   [985,]  3.441743209
##   [986,]  4.258932853
##   [987,]  2.897703128
##   [988,]  4.506496678
##   [989,]  3.490065395
##   [990,]  5.413272411
##   [991,]  5.119245346
##   [992,]  1.364110524
##   [993,]  3.793579206
##   [994,]  4.944984606
##   [995,]  3.776437403
##   [996,]  2.357756642
##   [997,]  6.043968234
##   [998,]  5.805805088
##   [999,]  6.535772398
## [1000,]  5.416873092
```

```
X_T=t(X)
X_T
```

```
##          [,1]       [,2]       [,3]      [,4]       [,5]       [,6]       [,7]
##    1.000000000 1.00000000 1.00000000 1.0000000 1.00000000 1.00000000 1.00000000
## x 0.006283144 0.01256604 0.01884844 0.0251301 0.03141076 0.03769018 0.04396812
## z 0.999684189 0.99873696 0.99715890 0.9949510 0.99211470 0.98865174 0.98456433
##          [,8]       [,9]      [,10]      [,11]      [,12]      [,13]     [,14]
##    1.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.0000000
## x 0.05024432 0.05651853 0.06279052 0.06906003 0.07532681 0.08159061 0.0878512
## z 0.97985505 0.97452687 0.96858316 0.96202767 0.95486454 0.94709830 0.9387339
##          [,15]      [,16]     [,17]     [,18]     [,19]     [,20]     [,21]
##    1.00000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.09410831 0.1003617 0.1066112 0.1128564 0.1190972 0.1253332 0.1315644
## z 0.92977649 0.9202318 0.9101060 0.8994053 0.8881364 0.8763067 0.8639234
##         [,22]     [,23]     [,24]     [,25]     [,26]     [,27]     [,28]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.1377903 0.1440108 0.1502256 0.1564345 0.1626372 0.1688334 0.1750231
## z 0.8509945 0.8375280 0.8235326 0.8090170 0.7939904 0.7784623 0.7624425
##         [,29]     [,30]     [,31]     [,32]     [,33]     [,34]     [,35]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.1812058 0.1873813 0.1935495 0.1997100 0.2058626 0.2120071 0.2181432
## z 0.7459411 0.7289686 0.7115357 0.6936533 0.6753328 0.6565858 0.6374240
##         [,36]     [,37]     [,38]     [,39]     [,40]     [,41]     [,42]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.2242708 0.2303894 0.2364990 0.2425992 0.2486899 0.2547707 0.2608415
## z 0.6178596 0.5979050 0.5775727 0.5568756 0.5358268 0.5144395 0.4927273
##         [,43]     [,44]     [,45]     [,46]     [,47]     [,48]     [,49]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.2669020 0.2729519 0.2789911 0.2850193 0.2910362 0.2970416 0.3030353
## z 0.4707039 0.4483832 0.4257793 0.4029064 0.3797791 0.3564119 0.3328195
##        [,50]     [,51]     [,52]     [,53]     [,54]     [,55]     [,56]     [,57]
##    1.000000 1.0000000 1.0000000 1.000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.309017 0.3149865 0.3209436 0.326888 0.3328195 0.3387379 0.3446429 0.3505343
## z 0.309017 0.2850193 0.2608415 0.236499 0.2120071 0.1873813 0.1626372 0.1377903
##        [,58]     [,59]      [,60]      [,61]      [,62]       [,63]       [,64]
##    1.0000000 1.0000000 1.00000000 1.00000000 1.00000000  1.00000000  1.00000000
## x 0.3564119 0.3622754 0.36812455 0.37395921 0.37977910  0.38558399  0.39137367
## z 0.1128564 0.0878512 0.06279052 0.03769018 0.01256604 -0.01256604 -0.03769018
##          [,65]      [,66]     [,67]     [,68]     [,69]     [,70]     [,71]
##     1.00000000  1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x   0.39714789  0.4029064 0.4086491 0.4143756 0.4200857 0.4257793 0.4314560
## z -0.06279052 -0.0878512 -0.1128564 -0.1377903 -0.1626372 -0.1873813 -0.2120071
##          [,72]      [,73]      [,74]      [,75]      [,76]      [,77]      [,78]
```

```
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.4371158  0.4427582  0.4483832  0.4539905  0.4595799  0.4651511  0.4707039
## z  -0.2364990 -0.2608415 -0.2850193 -0.3090170 -0.3328195 -0.3564119 -0.3797791
##         [,79]      [,80]      [,81]      [,82]      [,83]      [,84]      [,85]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.4762382  0.4817537  0.4872501  0.4927273  0.4981851  0.5036232  0.5090414
## z  -0.4029064 -0.4257793 -0.4483832 -0.4707039 -0.4927273 -0.5144395 -0.5358268
##         [,86]      [,87]      [,88]      [,89]      [,90]      [,91]      [,92]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.5144395  0.5198173  0.5251746  0.5305112  0.5358268  0.5411213  0.5463943
## z  -0.5568756 -0.5775727 -0.5979050 -0.6178596 -0.6374240 -0.6565858 -0.6753328
##         [,93]      [,94]      [,95]      [,96]      [,97]      [,98]      [,99]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.5516459  0.5568756  0.5620834  0.5672689  0.5724321  0.5775727  0.5826905
## z  -0.6936533 -0.7115357 -0.7289686 -0.7459411 -0.7624425 -0.7784623 -0.7939904
##        [,100]     [,101]     [,102]     [,103]     [,104]     [,105]     [,106]
##      1.0000000  1.0000000  1.000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.5877853  0.5928568  0.597905  0.6029295  0.6079303  0.6129071  0.6178596
## z  -0.8090170 -0.8235326 -0.837528 -0.8509945 -0.8639234 -0.8763067 -0.8881364
##        [,107]     [,108]     [,109]     [,110]     [,111]     [,112]     [,113]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.6227878  0.6276914  0.6325702  0.6374240  0.6422527  0.6470560  0.6518337
## z  -0.8994053 -0.9101060 -0.9202318 -0.9297765 -0.9387339 -0.9470983 -0.9548645
##        [,114]     [,115]     [,116]     [,117]     [,118]     [,119]     [,120]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.6565858  0.6613119  0.6660119  0.6706856  0.6753328  0.6799534  0.6845471
## z  -0.9620277 -0.9685832 -0.9745269 -0.9798551 -0.9845643 -0.9886517 -0.9921147
##        [,121]     [,122]     [,123]     [,124]     [,125]     [,126]     [,127]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.6891138  0.6936533  0.6981654  0.7026500  0.7071068  0.7115357  0.7159365
## z  -0.9949510 -0.9971589 -0.9987370 -0.9996842 -1.0000000 -0.9996842 -0.9987370
##        [,128]     [,129]     [,130]     [,131]     [,132]     [,133]     [,134]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.7203090  0.7246531  0.7289686  0.7332553  0.7375131  0.7417418  0.7459411
## z  -0.9971589 -0.9949510 -0.9921147 -0.9886517 -0.9845643 -0.9798551 -0.9745269
##        [,135]     [,136]     [,137]     [,138]     [,139]     [,140]     [,141]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.7501111  0.7542514  0.7583619  0.7624425  0.7664930  0.7705132  0.7745031
## z  -0.9685832 -0.9620277 -0.9548645 -0.9470983 -0.9387339 -0.9297765 -0.9202318
##        [,142]     [,143]     [,144]     [,145]     [,146]     [,147]     [,148]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.000000
## x   0.7784623  0.7823908  0.7862884  0.7901550  0.7939904  0.7977944  0.801567
## z  -0.9101060 -0.8994053 -0.8881364 -0.8763067 -0.8639234 -0.8509945 -0.837528
##        [,149]     [,150]     [,151]     [,152]     [,153]     [,154]     [,155]
##      1.0000000  1.000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
```

```
## x   0.8053079   0.809017   0.8126942   0.8163393   0.8199521   0.8235326   0.8270806
## z  -0.8235326  -0.809017  -0.7939904  -0.7784623  -0.7624425  -0.7459411  -0.7289686
##          [,156]      [,157]      [,158]      [,159]      [,160]      [,161]      [,162]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8305959   0.8340784   0.8375280   0.8409446   0.8443279   0.8476779   0.8509945
## z  -0.7115357  -0.6936533  -0.6753328  -0.6565858  -0.6374240  -0.6178596  -0.5979050
##          [,163]      [,164]      [,165]      [,166]      [,167]      [,168]      [,169]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8542774   0.8575267   0.8607420   0.8639234   0.8670707   0.8701838   0.8732625
## z  -0.5775727  -0.5568756  -0.5358268  -0.5144395  -0.4927273  -0.4707039  -0.4483832
##          [,170]      [,171]      [,172]      [,173]      [,174]      [,175]      [,176]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8763067   0.8793163   0.8822912   0.8852313   0.8881364   0.8910065   0.8938414
## z  -0.4257793  -0.4029064  -0.3797791  -0.3564119  -0.3328195  -0.3090170  -0.2850193
##          [,177]      [,178]      [,179]      [,180]      [,181]      [,182]      [,183]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8966410   0.8994053   0.9021340   0.9048271   0.9074844   0.9101060   0.9126916
## z  -0.2608415  -0.2364990  -0.2120071  -0.1873813  -0.1626372  -0.1377903  -0.1128564
##          [,184]       [,185]       [,186]       [,187]       [,188]       [,189]
##      1.0000000    1.00000000   1.00000000   1.00000000   1.00000000   1.00000000
## x   0.9152412    0.91775463   0.92023185   0.92267274   0.92507721   0.92744515
## z  -0.0878512   -0.06279052  -0.03769018  -0.01256604   0.01256604   0.03769018
##          [,190]      [,191]      [,192]      [,193]      [,194]      [,195]      [,196]
##      1.00000000  1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.92977649  0.9320711   0.9343289   0.9365499   0.9387339   0.9408808   0.9429905
## z   0.06279052  0.0878512   0.1128564   0.1377903   0.1626372   0.1873813   0.2120071
##          [,197]      [,198]      [,199]      [,200]      [,201]      [,202]      [,203]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.9450631   0.9470983   0.9490961   0.9510565   0.9529793   0.9548645   0.9567121
## z   0.2364990   0.2608415   0.2850193   0.3090170   0.3328195   0.3564119   0.3797791
##          [,204]      [,205]      [,206]      [,207]      [,208]      [,209]      [,210]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.9585218   0.9602937   0.9620277   0.9637237   0.9653816   0.9670015   0.9685832
## z   0.4029064   0.4257793   0.4483832   0.4707039   0.4927273   0.5144395   0.5358268
##          [,211]      [,212]      [,213]      [,214]      [,215]      [,216]      [,217]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.9701266   0.9716317   0.9730985   0.9745269   0.9759168   0.9772681   0.9785809
## z   0.5568756   0.5775727   0.5979050   0.6178596   0.6374240   0.6565858   0.6753328
##          [,218]      [,219]      [,220]      [,221]      [,222]      [,223]      [,224]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.9798551   0.9810905   0.9822873   0.9834452   0.9845643   0.9856446   0.9866859
## z   0.6936533   0.7115357   0.7289686   0.7459411   0.7624425   0.7784623   0.7939904
##          [,225]      [,226]      [,227]      [,228]      [,229]      [,230]      [,231]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.9876883   0.9886517   0.9895761   0.9904614   0.9913076   0.9921147   0.9928826
```

```
## z 0.8090170 0.8235326 0.8375280 0.8509945 0.8639234 0.8763067 0.8881364
##        [,232]     [,233]     [,234]     [,235]     [,236]     [,237]     [,238]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9936113  0.9943008  0.9949510  0.9955620  0.9961336  0.9966659  0.9971589
## z  0.8994053  0.9101060  0.9202318  0.9297765  0.9387339  0.9470983  0.9548645
##        [,239]     [,240]     [,241]     [,242]     [,243]     [,244]     [,245]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9976125  0.9980267  0.9984016  0.9987370  0.9990329  0.9992895  0.9995066
## z  0.9620277  0.9685832  0.9745269  0.9798551  0.9845643  0.9886517  0.9921147
##        [,246]     [,247]    [,248]     [,249] [,250]     [,251]    [,252]     [,253]
##     1.0000000  1.0000000  1.000000  1.0000000      1  1.0000000  1.000000  1.0000000
## x  0.9996842  0.9998224  0.999921  0.9999803      1  0.9999803  0.999921  0.9998224
## z  0.9949510  0.9971589  0.998737  0.9996842      1  0.9996842  0.998737  0.9971589
##        [,254]     [,255]     [,256]     [,257]     [,258]     [,259]     [,260]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9996842  0.9995066  0.9992895  0.9990329  0.9987370  0.9984016  0.9980267
## z  0.9949510  0.9921147  0.9886517  0.9845643  0.9798551  0.9745269  0.9685832
##        [,261]     [,262]     [,263]     [,264]     [,265]     [,266]     [,267]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9976125  0.9971589  0.9966659  0.9961336  0.9955620  0.9949510  0.9943008
## z  0.9620277  0.9548645  0.9470983  0.9387339  0.9297765  0.9202318  0.9101060
##        [,268]     [,269]     [,270]     [,271]     [,272]     [,273]     [,274]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9936113  0.9928826  0.9921147  0.9913076  0.9904614  0.9895761  0.9886517
## z  0.8994053  0.8881364  0.8763067  0.8639234  0.8509945  0.8375280  0.8235326
##        [,275]     [,276]     [,277]     [,278]     [,279]     [,280]     [,281]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9876883  0.9866859  0.9856446  0.9845643  0.9834452  0.9822873  0.9810905
## z  0.8090170  0.7939904  0.7784623  0.7624425  0.7459411  0.7289686  0.7115357
##        [,282]     [,283]     [,284]     [,285]     [,286]     [,287]     [,288]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9798551  0.9785809  0.9772681  0.9759168  0.9745269  0.9730985  0.9716317
## z  0.6936533  0.6753328  0.6565858  0.6374240  0.6178596  0.5979050  0.5775727
##        [,289]     [,290]     [,291]     [,292]     [,293]     [,294]     [,295]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9701266  0.9685832  0.9670015  0.9653816  0.9637237  0.9620277  0.9602937
## z  0.5568756  0.5358268  0.5144395  0.4927273  0.4707039  0.4483832  0.4257793
##        [,296]     [,297]     [,298]     [,299]     [,300]     [,301]     [,302]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9585218  0.9567121  0.9548645  0.9529793  0.9510565  0.9490961  0.9470983
## z  0.4029064  0.3797791  0.3564119  0.3328195  0.3090170  0.2850193  0.2608415
##        [,303]     [,304]     [,305]     [,306]     [,307]     [,308]     [,309]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x  0.9450631  0.9429905  0.9408808  0.9387339  0.9365499  0.9343289  0.9320711
## z  0.2364990  0.2120071  0.1873813  0.1626372  0.1377903  0.1128564  0.0878512
```

```
##          [,310]      [,311]      [,312]      [,313]      [,314]      [,315]
##     1.00000000  1.00000000  1.00000000  1.00000000  1.00000000  1.00000000
## x   0.92977649  0.92744515  0.92507721  0.92267274  0.92023185  0.91775463
## z   0.06279052  0.03769018  0.01256604 -0.01256604 -0.03769018 -0.06279052
##          [,316]      [,317]      [,318]      [,319]      [,320]      [,321]      [,322]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.9152412   0.9126916   0.9101060   0.9074844   0.9048271   0.9021340   0.8994053
## z  -0.0878512  -0.1128564  -0.1377903  -0.1626372  -0.1873813  -0.2120071  -0.2364990
##          [,323]      [,324]      [,325]      [,326]      [,327]      [,328]      [,329]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8966410   0.8938414   0.8910065   0.8881364   0.8852313   0.8822912   0.8793163
## z  -0.2608415  -0.2850193  -0.3090170  -0.3328195  -0.3564119  -0.3797791  -0.4029064
##          [,330]      [,331]      [,332]      [,333]      [,334]      [,335]      [,336]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8763067   0.8732625   0.8701838   0.8670707   0.8639234   0.8607420   0.8575267
## z  -0.4257793  -0.4483832  -0.4707039  -0.4927273  -0.5144395  -0.5358268  -0.5568756
##          [,337]      [,338]      [,339]      [,340]      [,341]      [,342]      [,343]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8542774   0.8509945   0.8476779   0.8443279   0.8409446   0.8375280   0.8340784
## z  -0.5775727  -0.5979050  -0.6178596  -0.6374240  -0.6565858  -0.6753328  -0.6936533
##          [,344]      [,345]      [,346]      [,347]      [,348]      [,349]      [,350]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.000000
## x   0.8305959   0.8270806   0.8235326   0.8199521   0.8163393   0.8126942   0.809017
## z  -0.7115357  -0.7289686  -0.7459411  -0.7624425  -0.7784623  -0.7939904  -0.809017
##          [,351]      [,352]      [,353]      [,354]      [,355]      [,356]      [,357]
##     1.0000000   1.000000    1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.8053079   0.801567    0.7977944   0.7939904   0.7901550   0.7862884   0.7823908
## z  -0.8235326  -0.837528   -0.8509945  -0.8639234  -0.8763067  -0.8881364  -0.8994053
##          [,358]      [,359]      [,360]      [,361]      [,362]      [,363]      [,364]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.7784623   0.7745031   0.7705132   0.7664930   0.7624425   0.7583619   0.7542514
## z  -0.9101060  -0.9202318  -0.9297765  -0.9387339  -0.9470983  -0.9548645  -0.9620277
##          [,365]      [,366]      [,367]      [,368]      [,369]      [,370]      [,371]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.7501111   0.7459411   0.7417418   0.7375131   0.7332553   0.7289686   0.7246531
## z  -0.9685832  -0.9745269  -0.9798551  -0.9845643  -0.9886517  -0.9921147  -0.9949510
##          [,372]      [,373]      [,374]      [,375]      [,376]      [,377]      [,378]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.7203090   0.7159365   0.7115357   0.7071068   0.7026500   0.6981654   0.6936533
## z  -0.9971589  -0.9987370  -0.9996842  -1.0000000  -0.9996842  -0.9987370  -0.9971589
##          [,379]      [,380]      [,381]      [,382]      [,383]      [,384]      [,385]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   0.6891138   0.6845471   0.6799534   0.6753328   0.6706856   0.6660119   0.6613119
## z  -0.9949510  -0.9921147  -0.9886517  -0.9845643  -0.9798551  -0.9745269  -0.9685832
##          [,386]      [,387]      [,388]      [,389]      [,390]      [,391]      [,392]
```

```
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.6565858  0.6518337  0.6470560  0.6422527  0.6374240  0.6325702  0.6276914
## z  -0.9620277 -0.9548645 -0.9470983 -0.9387339 -0.9297765 -0.9202318 -0.9101060
##         [,393]     [,394]     [,395]     [,396]     [,397]     [,398]     [,399]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.000000  1.0000000
## x   0.6227878  0.6178596  0.6129071  0.6079303  0.6029295  0.597905  0.5928568
## z  -0.8994053 -0.8881364 -0.8763067 -0.8639234 -0.8509945 -0.837528 -0.8235326
##         [,400]     [,401]     [,402]     [,403]     [,404]     [,405]     [,406]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.5877853  0.5826905  0.5775727  0.5724321  0.5672689  0.5620834  0.5568756
## z  -0.8090170 -0.7939904 -0.7784623 -0.7624425 -0.7459411 -0.7289686 -0.7115357
##         [,407]     [,408]     [,409]     [,410]     [,411]     [,412]     [,413]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.5516459  0.5463943  0.5411213  0.5358268  0.5305112  0.5251746  0.5198173
## z  -0.6936533 -0.6753328 -0.6565858 -0.6374240 -0.6178596 -0.5979050 -0.5775727
##         [,414]     [,415]     [,416]     [,417]     [,418]     [,419]     [,420]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.5144395  0.5090414  0.5036232  0.4981851  0.4927273  0.4872501  0.4817537
## z  -0.5568756 -0.5358268 -0.5144395 -0.4927273 -0.4707039 -0.4483832 -0.4257793
##         [,421]     [,422]     [,423]     [,424]     [,425]     [,426]     [,427]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.4762382  0.4707039  0.4651511  0.4595799  0.4539905  0.4483832  0.4427582
## z  -0.4029064 -0.3797791 -0.3564119 -0.3328195 -0.3090170 -0.2850193 -0.2608415
##         [,428]     [,429]     [,430]     [,431]     [,432]     [,433]     [,434]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x   0.4371158  0.4314560  0.4257793  0.4200857  0.4143756  0.4086491  0.4029064
## z  -0.2364990 -0.2120071 -0.1873813 -0.1626372 -0.1377903 -0.1128564 -0.0878512
##          [,435]      [,436]      [,437]     [,438]      [,439]      [,440]
##     1.00000000  1.00000000  1.00000000 1.00000000 1.00000000 1.00000000
## x   0.39714789  0.39137367  0.38558399 0.37977910 0.37395921 0.36812455
## z  -0.06279052 -0.03769018 -0.01256604 0.01256604 0.03769018 0.06279052
##        [,441]    [,442]    [,443]    [,444]    [,445]    [,446]    [,447]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.000000
## x  0.3622754 0.3564119 0.3505343 0.3446429 0.3387379 0.3328195 0.326888
## z  0.0878512 0.1128564 0.1377903 0.1626372 0.1873813 0.2120071 0.236499
##        [,448]    [,449]    [,450]    [,451]    [,452]    [,453]    [,454]
##    1.0000000 1.0000000 1.000000 1.0000000 1.0000000 1.0000000 1.0000000
## x  0.3209436 0.3149865 0.309017 0.3030353 0.2970416 0.2910362 0.2850193
## z  0.2608415 0.2850193 0.309017 0.3328195 0.3564119 0.3797791 0.4029064
##        [,455]    [,456]    [,457]    [,458]    [,459]    [,460]    [,461]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x  0.2789911 0.2729519 0.2669020 0.2608415 0.2547707 0.2486899 0.2425992
## z  0.4257793 0.4483832 0.4707039 0.4927273 0.5144395 0.5358268 0.5568756
##        [,462]    [,463]    [,464]    [,465]    [,466]    [,467]    [,468]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
```

```
## x 0.2364990 0.2303894 0.2242708 0.2181432 0.2120071 0.2058626 0.1997100
## z 0.5775727 0.5979050 0.6178596 0.6374240 0.6565858 0.6753328 0.6936533
##        [,469]     [,470]     [,471]     [,472]     [,473]     [,474]     [,475]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.1935495 0.1873813 0.1812058 0.1750231 0.1688334 0.1626372 0.1564345
## z 0.7115357 0.7289686 0.7459411 0.7624425 0.7784623 0.7939904 0.8090170
##        [,476]     [,477]     [,478]     [,479]     [,480]     [,481]     [,482]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x 0.1502256 0.1440108 0.1377903 0.1315644 0.1253332 0.1190972 0.1128564
## z 0.8235326 0.8375280 0.8509945 0.8639234 0.8763067 0.8881364 0.8994053
##        [,483]     [,484]     [,485]     [,486]     [,487]     [,488]     [,489]
##    1.0000000 1.0000000 1.00000000 1.0000000 1.00000000 1.00000000 1.00000000
## x 0.1066112 0.1003617 0.09410831 0.0878512 0.08159061 0.07532681 0.06906003
## z 0.9101060 0.9202318 0.92977649 0.9387339 0.94709830 0.95486454 0.96202767
##        [,490]     [,491]     [,492]     [,493]     [,494]     [,495]     [,496]
##    1.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.0000000
## x 0.06279052 0.05651853 0.05024432 0.04396812 0.03769018 0.03141076 0.0251301
## z 0.96858316 0.97452687 0.97985505 0.98456433 0.98865174 0.99211470 0.9949510
##        [,497]     [,498]      [,499]      [,500]      [,501]     [,502]
##    1.00000000 1.00000000 1.000000000 1.000000e+00  1.000000000 1.00000000
## x 0.01884844 0.01256604 0.006283144 1.224606e-16 -0.006283144 -0.01256604
## z 0.99715890 0.99873696 0.999684189 1.000000e+00  0.999684189  0.99873696
##         [,503]     [,504]     [,505]     [,506]     [,507]      [,508]
##    1.00000000 1.0000000 1.00000000 1.00000000 1.00000000 1.00000000
## x -0.01884844 -0.0251301 -0.03141076 -0.03769018 -0.04396812 -0.05024432
## z  0.99715890 0.9949510 0.99211470 0.98865174 0.98456433 0.97985505
##          [,509]      [,510]      [,511]      [,512]      [,513]      [,514]
##    1.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.0000000
## x -0.05651853 -0.06279052 -0.06906003 -0.07532681 -0.08159061 -0.0878512
## z  0.97452687  0.96858316  0.96202767  0.95486454  0.94709830  0.9387339
##          [,515]     [,516]     [,517]     [,518]     [,519]     [,520]      [,521]
##    1.00000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x -0.09410831 -0.1003617 -0.1066112 -0.1128564 -0.1190972 -0.1253332 -0.1315644
## z  0.92977649 0.9202318 0.9101060 0.8994053 0.8881364 0.8763067 0.8639234
##          [,522]     [,523]     [,524]     [,525]     [,526]     [,527]     [,528]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x -0.1377903 -0.1440108 -0.1502256 -0.1564345 -0.1626372 -0.1688334 -0.1750231
## z  0.8509945  0.8375280 0.8235326 0.8090170 0.7939904 0.7784623 0.7624425
##          [,529]     [,530]     [,531]     [,532]     [,533]     [,534]     [,535]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x -0.1812058 -0.1873813 -0.1935495 -0.1997100 -0.2058626 -0.2120071 -0.2181432
## z  0.7459411 0.7289686 0.7115357 0.6936533 0.6753328 0.6565858 0.6374240
##          [,536]     [,537]     [,538]     [,539]     [,540]     [,541]     [,542]
##    1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## x -0.2242708 -0.2303894 -0.2364990 -0.2425992 -0.2486899 -0.2547707 -0.2608415
```

```
## z   0.6178596   0.5979050   0.5775727   0.5568756   0.5358268   0.5144395   0.4927273
##        [,543]      [,544]      [,545]      [,546]      [,547]      [,548]      [,549]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.2669020  -0.2729519  -0.2789911  -0.2850193  -0.2910362  -0.2970416  -0.3030353
## z   0.4707039   0.4483832   0.4257793   0.4029064   0.3797791   0.3564119   0.3328195
##        [,550]      [,551]      [,552]      [,553]      [,554]      [,555]      [,556]
##      1.000000   1.0000000   1.0000000   1.000000   1.0000000   1.0000000   1.0000000
## x  -0.309017  -0.3149865  -0.3209436  -0.326888  -0.3328195  -0.3387379  -0.3446429
## z   0.309017   0.2850193   0.2608415   0.236499   0.2120071   0.1873813   0.1626372
##        [,557]      [,558]      [,559]      [,560]      [,561]      [,562]
##      1.0000000   1.0000000   1.0000000   1.00000000  1.00000000  1.00000000
## x  -0.3505343  -0.3564119  -0.3622754  -0.36812455 -0.37395921 -0.37977910
## z   0.1377903   0.1128564   0.0878512   0.06279052  0.03769018  0.01256604
##         [,563]       [,564]       [,565]      [,566]      [,567]      [,568]
##      1.00000000   1.00000000   1.00000000   1.0000000   1.0000000   1.0000000
## x  -0.38558399  -0.39137367  -0.39714789  -0.4029064  -0.4086491  -0.4143756
## z  -0.01256604  -0.03769018  -0.06279052  -0.0878512  -0.1128564  -0.1377903
##         [,569]      [,570]      [,571]      [,572]      [,573]      [,574]      [,575]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.4200857  -0.4257793  -0.4314560  -0.4371158  -0.4427582  -0.4483832  -0.4539905
## z  -0.1626372  -0.1873813  -0.2120071  -0.2364990  -0.2608415  -0.2850193  -0.3090170
##         [,576]      [,577]      [,578]      [,579]      [,580]      [,581]      [,582]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.4595799  -0.4651511  -0.4707039  -0.4762382  -0.4817537  -0.4872501  -0.4927273
## z  -0.3328195  -0.3564119  -0.3797791  -0.4029064  -0.4257793  -0.4483832  -0.4707039
##         [,583]      [,584]      [,585]      [,586]      [,587]      [,588]      [,589]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.4981851  -0.5036232  -0.5090414  -0.5144395  -0.5198173  -0.5251746  -0.5305112
## z  -0.4927273  -0.5144395  -0.5358268  -0.5568756  -0.5775727  -0.5979050  -0.6178596
##         [,590]      [,591]      [,592]      [,593]      [,594]      [,595]      [,596]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.5358268  -0.5411213  -0.5463943  -0.5516459  -0.5568756  -0.5620834  -0.5672689
## z  -0.6374240  -0.6565858  -0.6753328  -0.6936533  -0.7115357  -0.7289686  -0.7459411
##         [,597]      [,598]      [,599]      [,600]      [,601]      [,602]      [,603]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.000000   1.0000000
## x  -0.5724321  -0.5775727  -0.5826905  -0.5877853  -0.5928568  -0.597905  -0.6029295
## z  -0.7624425  -0.7784623  -0.7939904  -0.8090170  -0.8235326  -0.837528  -0.8509945
##         [,604]      [,605]      [,606]      [,607]      [,608]      [,609]      [,610]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.6079303  -0.6129071  -0.6178596  -0.6227878  -0.6276914  -0.6325702  -0.6374240
## z  -0.8639234  -0.8763067  -0.8881364  -0.8994053  -0.9101060  -0.9202318  -0.9297765
##         [,611]      [,612]      [,613]      [,614]      [,615]      [,616]      [,617]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.6422527  -0.6470560  -0.6518337  -0.6565858  -0.6613119  -0.6660119  -0.6706856
## z  -0.9387339  -0.9470983  -0.9548645  -0.9620277  -0.9685832  -0.9745269  -0.9798551
```

```
##         [,618]      [,619]      [,620]      [,621]      [,622]      [,623]      [,624]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.6753328  -0.6799534  -0.6845471  -0.6891138  -0.6936533  -0.6981654  -0.7026500
## z   -0.9845643  -0.9886517  -0.9921147  -0.9949510  -0.9971589  -0.9987370  -0.9996842
##         [,625]      [,626]      [,627]      [,628]      [,629]      [,630]      [,631]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.7071068  -0.7115357  -0.7159365  -0.7203090  -0.7246531  -0.7289686  -0.7332553
## z   -1.0000000  -0.9996842  -0.9987370  -0.9971589  -0.9949510  -0.9921147  -0.9886517
##         [,632]      [,633]      [,634]      [,635]      [,636]      [,637]      [,638]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.7375131  -0.7417418  -0.7459411  -0.7501111  -0.7542514  -0.7583619  -0.7624425
## z   -0.9845643  -0.9798551  -0.9745269  -0.9685832  -0.9620277  -0.9548645  -0.9470983
##         [,639]      [,640]      [,641]      [,642]      [,643]      [,644]      [,645]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.7664930  -0.7705132  -0.7745031  -0.7784623  -0.7823908  -0.7862884  -0.7901550
## z   -0.9387339  -0.9297765  -0.9202318  -0.9101060  -0.8994053  -0.8881364  -0.8763067
##         [,646]      [,647]      [,648]      [,649]      [,650]      [,651]      [,652]
##      1.0000000   1.0000000   1.000000   1.0000000   1.000000   1.0000000   1.0000000
## x   -0.7939904  -0.7977944  -0.801567  -0.8053079  -0.809017  -0.8126942  -0.8163393
## z   -0.8639234  -0.8509945  -0.837528  -0.8235326  -0.809017  -0.7939904  -0.7784623
##         [,653]      [,654]      [,655]      [,656]      [,657]      [,658]      [,659]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.8199521  -0.8235326  -0.8270806  -0.8305959  -0.8340784  -0.8375280  -0.8409446
## z   -0.7624425  -0.7459411  -0.7289686  -0.7115357  -0.6936533  -0.6753328  -0.6565858
##         [,660]      [,661]      [,662]      [,663]      [,664]      [,665]      [,666]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.8443279  -0.8476779  -0.8509945  -0.8542774  -0.8575267  -0.8607420  -0.8639234
## z   -0.6374240  -0.6178596  -0.5979050  -0.5775727  -0.5568756  -0.5358268  -0.5144395
##         [,667]      [,668]      [,669]      [,670]      [,671]      [,672]      [,673]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.8670707  -0.8701838  -0.8732625  -0.8763067  -0.8793163  -0.8822912  -0.8852313
## z   -0.4927273  -0.4707039  -0.4483832  -0.4257793  -0.4029064  -0.3797791  -0.3564119
##         [,674]      [,675]      [,676]      [,677]      [,678]      [,679]      [,680]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x   -0.8881364  -0.8910065  -0.8938414  -0.8966410  -0.8994053  -0.9021340  -0.9048271
## z   -0.3328195  -0.3090170  -0.2850193  -0.2608415  -0.2364990  -0.2120071  -0.1873813
##         [,681]      [,682]      [,683]      [,684]      [,685]       [,686]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.00000000   1.00000000
## x   -0.9074844  -0.9101060  -0.9126916  -0.9152412  -0.91775463  -0.92023185
## z   -0.1626372  -0.1377903  -0.1128564  -0.0878512  -0.06279052  -0.03769018
##         [,687]       [,688]       [,689]       [,690]       [,691]       [,692]
##      1.00000000   1.00000000   1.00000000   1.00000000   1.0000000   1.0000000
## x   -0.92267274  -0.92507721  -0.92744515  -0.92977649  -0.9320711  -0.9343289
## z   -0.01256604   0.01256604   0.03769018   0.06279052   0.0878512   0.1128564
##         [,693]      [,694]      [,695]      [,696]      [,697]      [,698]      [,699]
```

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```
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9365499 -0.9387339 -0.9408808 -0.9429905 -0.9450631 -0.9470983 -0.9490961
## z  0.1377903  0.1626372  0.1873813  0.2120071  0.2364990  0.2608415  0.2850193
##        [,700]     [,701]     [,702]     [,703]     [,704]     [,705]     [,706]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9510565 -0.9529793 -0.9548645 -0.9567121 -0.9585218 -0.9602937 -0.9620277
## z  0.3090170  0.3328195  0.3564119  0.3797791  0.4029064  0.4257793  0.4483832
##        [,707]     [,708]     [,709]     [,710]     [,711]     [,712]     [,713]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9637237 -0.9653816 -0.9670015 -0.9685832 -0.9701266 -0.9716317 -0.9730985
## z  0.4707039  0.4927273  0.5144395  0.5358268  0.5568756  0.5775727  0.5979050
##        [,714]     [,715]     [,716]     [,717]     [,718]     [,719]     [,720]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9745269 -0.9759168 -0.9772681 -0.9785809 -0.9798551 -0.9810905 -0.9822873
## z  0.6178596  0.6374240  0.6565858  0.6753328  0.6936533  0.7115357  0.7289686
##        [,721]     [,722]     [,723]     [,724]     [,725]     [,726]     [,727]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9834452 -0.9845643 -0.9856446 -0.9866859 -0.9876883 -0.9886517 -0.9895761
## z  0.7459411  0.7624425  0.7784623  0.7939904  0.8090170  0.8235326  0.8375280
##        [,728]     [,729]     [,730]     [,731]     [,732]     [,733]     [,734]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9904614 -0.9913076 -0.9921147 -0.9928826 -0.9936113 -0.9943008 -0.9949510
## z  0.8509945  0.8639234  0.8763067  0.8881364  0.8994053  0.9101060  0.9202318
##        [,735]     [,736]     [,737]     [,738]     [,739]     [,740]     [,741]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9955620 -0.9961336 -0.9966659 -0.9971589 -0.9976125 -0.9980267 -0.9984016
## z  0.9297765  0.9387339  0.9470983  0.9548645  0.9620277  0.9685832  0.9745269
##        [,742]     [,743]     [,744]     [,745]     [,746]     [,747]    [,748]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.000000
## x -0.9987370 -0.9990329 -0.9992895 -0.9995066 -0.9996842 -0.9998224 -0.999921
## z  0.9798551  0.9845643  0.9886517  0.9921147  0.9949510  0.9971589  0.998737
##        [,749] [,750]     [,751]     [,752]     [,753]     [,754]     [,755]
##      1.0000000      1  1.0000000  1.000000  1.0000000  1.0000000  1.0000000
## x -0.9999803     -1 -0.9999803 -0.999921 -0.9998224 -0.9996842 -0.9995066
## z  0.9996842      1  0.9996842  0.998737  0.9971589  0.9949510  0.9921147
##        [,756]     [,757]     [,758]     [,759]     [,760]     [,761]     [,762]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9992895 -0.9990329 -0.9987370 -0.9984016 -0.9980267 -0.9976125 -0.9971589
## z  0.9886517  0.9845643  0.9798551  0.9745269  0.9685832  0.9620277  0.9548645
##        [,763]     [,764]     [,765]     [,766]     [,767]     [,768]     [,769]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9966659 -0.9961336 -0.9955620 -0.9949510 -0.9943008 -0.9936113 -0.9928826
## z  0.9470983  0.9387339  0.9297765  0.9202318  0.9101060  0.8994053  0.8881364
##        [,770]     [,771]     [,772]     [,773]     [,774]     [,775]     [,776]
##      1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
```

```
## x -0.9921147 -0.9913076 -0.9904614 -0.9895761 -0.9886517 -0.9876883 -0.9866859
## z  0.8763067  0.8639234  0.8509945  0.8375280  0.8235326  0.8090170  0.7939904
##        [,777]     [,778]     [,779]     [,780]     [,781]     [,782]     [,783]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9856446 -0.9845643 -0.9834452 -0.9822873 -0.9810905 -0.9798551 -0.9785809
## z  0.7784623  0.7624425  0.7459411  0.7289686  0.7115357  0.6936533  0.6753328
##        [,784]     [,785]     [,786]     [,787]     [,788]     [,789]     [,790]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9772681 -0.9759168 -0.9745269 -0.9730985 -0.9716317 -0.9701266 -0.9685832
## z  0.6565858  0.6374240  0.6178596  0.5979050  0.5775727  0.5568756  0.5358268
##        [,791]     [,792]     [,793]     [,794]     [,795]     [,796]     [,797]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9670015 -0.9653816 -0.9637237 -0.9620277 -0.9602937 -0.9585218 -0.9567121
## z  0.5144395  0.4927273  0.4707039  0.4483832  0.4257793  0.4029064  0.3797791
##        [,798]     [,799]     [,800]     [,801]     [,802]     [,803]     [,804]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9548645 -0.9529793 -0.9510565 -0.9490961 -0.9470983 -0.9450631 -0.9429905
## z  0.3564119  0.3328195  0.3090170  0.2850193  0.2608415  0.2364990  0.2120071
##        [,805]     [,806]     [,807]     [,808]     [,809]     [,810]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.00000000
## x -0.9408808 -0.9387339 -0.9365499 -0.9343289 -0.9320711 -0.92977649
## z  0.1873813  0.1626372  0.1377903  0.1128564  0.0878512  0.06279052
##        [,811]     [,812]     [,813]     [,814]     [,815]     [,816]
##     1.00000000  1.00000000  1.00000000  1.00000000  1.00000000  1.0000000
## x -0.92744515 -0.92507721 -0.92267274 -0.92023185 -0.91775463 -0.9152412
## z  0.03769018  0.01256604 -0.01256604 -0.03769018 -0.06279052 -0.0878512
##        [,817]     [,818]     [,819]     [,820]     [,821]     [,822]     [,823]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.9126916 -0.9101060 -0.9074844 -0.9048271 -0.9021340 -0.8994053 -0.8966410
## z -0.1128564 -0.1377903 -0.1626372 -0.1873813 -0.2120071 -0.2364990 -0.2608415
##        [,824]     [,825]     [,826]     [,827]     [,828]     [,829]     [,830]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.8938414 -0.8910065 -0.8881364 -0.8852313 -0.8822912 -0.8793163 -0.8763067
## z -0.2850193 -0.3090170 -0.3328195 -0.3564119 -0.3797791 -0.4029064 -0.4257793
##        [,831]     [,832]     [,833]     [,834]     [,835]     [,836]     [,837]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.8732625 -0.8701838 -0.8670707 -0.8639234 -0.8607420 -0.8575267 -0.8542774
## z -0.4483832 -0.4707039 -0.4927273 -0.5144395 -0.5358268 -0.5568756 -0.5775727
##        [,838]     [,839]     [,840]     [,841]     [,842]     [,843]     [,844]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.0000000
## x -0.8509945 -0.8476779 -0.8443279 -0.8409446 -0.8375280 -0.8340784 -0.8305959
## z -0.5979050 -0.6178596 -0.6374240 -0.6565858 -0.6753328 -0.6936533 -0.7115357
##        [,845]     [,846]     [,847]     [,848]     [,849]     [,850]     [,851]
##     1.0000000  1.0000000  1.0000000  1.0000000  1.0000000  1.000000  1.0000000
## x -0.8270806 -0.8235326 -0.8199521 -0.8163393 -0.8126942 -0.809017 -0.8053079
```

```
## z -0.7289686 -0.7459411 -0.7624425 -0.7784623 -0.7939904 -0.809017 -0.8235326
##        [,852]      [,853]      [,854]      [,855]      [,856]      [,857]      [,858]
##     1.000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.801567 -0.7977944 -0.7939904 -0.7901550 -0.7862884 -0.7823908 -0.7784623
## z -0.837528 -0.8509945 -0.8639234 -0.8763067 -0.8881364 -0.8994053 -0.9101060
##        [,859]      [,860]      [,861]      [,862]      [,863]      [,864]      [,865]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.7745031 -0.7705132 -0.7664930 -0.7624425 -0.7583619 -0.7542514 -0.7501111
## z -0.9202318 -0.9297765 -0.9387339 -0.9470983 -0.9548645 -0.9620277 -0.9685832
##        [,866]      [,867]      [,868]      [,869]      [,870]      [,871]      [,872]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.7459411 -0.7417418 -0.7375131 -0.7332553 -0.7289686 -0.7246531 -0.7203090
## z -0.9745269 -0.9798551 -0.9845643 -0.9886517 -0.9921147 -0.9949510 -0.9971589
##        [,873]      [,874]      [,875]      [,876]      [,877]      [,878]      [,879]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.7159365 -0.7115357 -0.7071068 -0.7026500 -0.6981654 -0.6936533 -0.6891138
## z -0.9987370 -0.9996842 -1.0000000 -0.9996842 -0.9987370 -0.9971589 -0.9949510
##        [,880]      [,881]      [,882]      [,883]      [,884]      [,885]      [,886]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.6845471 -0.6799534 -0.6753328 -0.6706856 -0.6660119 -0.6613119 -0.6565858
## z -0.9921147 -0.9886517 -0.9845643 -0.9798551 -0.9745269 -0.9685832 -0.9620277
##        [,887]      [,888]      [,889]      [,890]      [,891]      [,892]      [,893]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.6518337 -0.6470560 -0.6422527 -0.6374240 -0.6325702 -0.6276914 -0.6227878
## z -0.9548645 -0.9470983 -0.9387339 -0.9297765 -0.9202318 -0.9101060 -0.8994053
##        [,894]      [,895]      [,896]      [,897]      [,898]      [,899]      [,900]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.000000   1.0000000   1.0000000
## x -0.6178596 -0.6129071 -0.6079303 -0.6029295 -0.597905 -0.5928568 -0.5877853
## z -0.8881364 -0.8763067 -0.8639234 -0.8509945 -0.837528 -0.8235326 -0.8090170
##        [,901]      [,902]      [,903]      [,904]      [,905]      [,906]      [,907]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.5826905 -0.5775727 -0.5724321 -0.5672689 -0.5620834 -0.5568756 -0.5516459
## z -0.7939904 -0.7784623 -0.7624425 -0.7459411 -0.7289686 -0.7115357 -0.6936533
##        [,908]      [,909]      [,910]      [,911]      [,912]      [,913]      [,914]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.5463943 -0.5411213 -0.5358268 -0.5305112 -0.5251746 -0.5198173 -0.5144395
## z -0.6753328 -0.6565858 -0.6374240 -0.6178596 -0.5979050 -0.5775727 -0.5568756
##        [,915]      [,916]      [,917]      [,918]      [,919]      [,920]      [,921]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.5090414 -0.5036232 -0.4981851 -0.4927273 -0.4872501 -0.4817537 -0.4762382
## z -0.5358268 -0.5144395 -0.4927273 -0.4707039 -0.4483832 -0.4257793 -0.4029064
##        [,922]      [,923]      [,924]      [,925]      [,926]      [,927]      [,928]
##     1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x -0.4707039 -0.4651511 -0.4595799 -0.4539905 -0.4483832 -0.4427582 -0.4371158
## z -0.3797791 -0.3564119 -0.3328195 -0.3090170 -0.2850193 -0.2608415 -0.2364990
```

99

```
##          [,929]      [,930]      [,931]      [,932]      [,933]      [,934]       [,935]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.00000000
## x  -0.4314560  -0.4257793  -0.4200857  -0.4143756  -0.4086491  -0.4029064  -0.39714789
## z  -0.2120071  -0.1873813  -0.1626372  -0.1377903  -0.1128564  -0.0878512  -0.06279052
##          [,936]      [,937]      [,938]      [,939]      [,940]     [,941]
##      1.00000000  1.00000000  1.00000000  1.00000000  1.00000000   1.0000000
## x  -0.39137367 -0.38558399 -0.37977910 -0.37395921 -0.36812455  -0.3622754
## z  -0.03769018 -0.01256604  0.01256604  0.03769018  0.06279052   0.0878512
##          [,942]      [,943]      [,944]      [,945]      [,946]     [,947]     [,948]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.000000   1.0000000
## x  -0.3564119  -0.3505343  -0.3446429  -0.3387379  -0.3328195  -0.326888  -0.3209436
## z   0.1128564   0.1377903   0.1626372   0.1873813   0.2120071   0.236499   0.2608415
##          [,949]      [,950]      [,951]      [,952]      [,953]      [,954]     [,955]
##      1.0000000   1.000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.3149865  -0.309017  -0.3030353  -0.2970416  -0.2910362  -0.2850193  -0.2789911
## z   0.2850193   0.309017   0.3328195   0.3564119   0.3797791   0.4029064   0.4257793
##          [,956]      [,957]      [,958]      [,959]      [,960]      [,961]     [,962]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.2729519  -0.2669020  -0.2608415  -0.2547707  -0.2486899  -0.2425992  -0.2364990
## z   0.4483832   0.4707039   0.4927273   0.5144395   0.5358268   0.5568756   0.5775727
##          [,963]      [,964]      [,965]      [,966]      [,967]      [,968]     [,969]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.2303894  -0.2242708  -0.2181432  -0.2120071  -0.2058626  -0.1997100  -0.1935495
## z   0.5979050   0.6178596   0.6374240   0.6565858   0.6753328   0.6936533   0.7115357
##          [,970]      [,971]      [,972]      [,973]      [,974]      [,975]     [,976]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.1873813  -0.1812058  -0.1750231  -0.1688334  -0.1626372  -0.1564345  -0.1502256
## z   0.7289686   0.7459411   0.7624425   0.7784623   0.7939904   0.8090170   0.8235326
##          [,977]      [,978]      [,979]      [,980]      [,981]      [,982]     [,983]
##      1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000   1.0000000
## x  -0.1440108  -0.1377903  -0.1315644  -0.1253332  -0.1190972  -0.1128564  -0.1066112
## z   0.8375280   0.8509945   0.8639234   0.8763067   0.8881364   0.8994053   0.9101060
##          [,984]       [,985]      [,986]       [,987]       [,988]      [,989]
##      1.0000000   1.00000000   1.0000000   1.00000000   1.00000000   1.00000000
## x  -0.1003617  -0.09410831  -0.0878512  -0.08159061  -0.07532681  -0.06906003
## z   0.9202318   0.92977649   0.9387339   0.94709830   0.95486454   0.96202767
##          [,990]       [,991]       [,992]       [,993]       [,994]       [,995]
##      1.00000000   1.00000000   1.00000000   1.00000000   1.00000000   1.00000000
## x  -0.06279052  -0.05651853  -0.05024432  -0.04396812  -0.03769018  -0.03141076
## z   0.96858316   0.97452687   0.97985505   0.98456433   0.98865174   0.99211470
##          [,996]       [,997]       [,998]        [,999]      [,1000]
##      1.0000000   1.00000000   1.00000000    1.000000000   1.000000e+00
## x  -0.0251301  -0.01884844  -0.01256604  -0.006283144  -2.449213e-16
## z   0.9949510   0.99715890   0.99873696    0.999684189   1.000000e+00
```

100

```
P=X_T %*% X
solve(P)
```

```
##                                x            z
##      1.000000e-03 -2.225759e-20 4.529710e-20
## x -2.225759e-20  2.000000e-03 4.327224e-20
## z  4.529710e-20  4.327224e-20 2.000000e-03
```
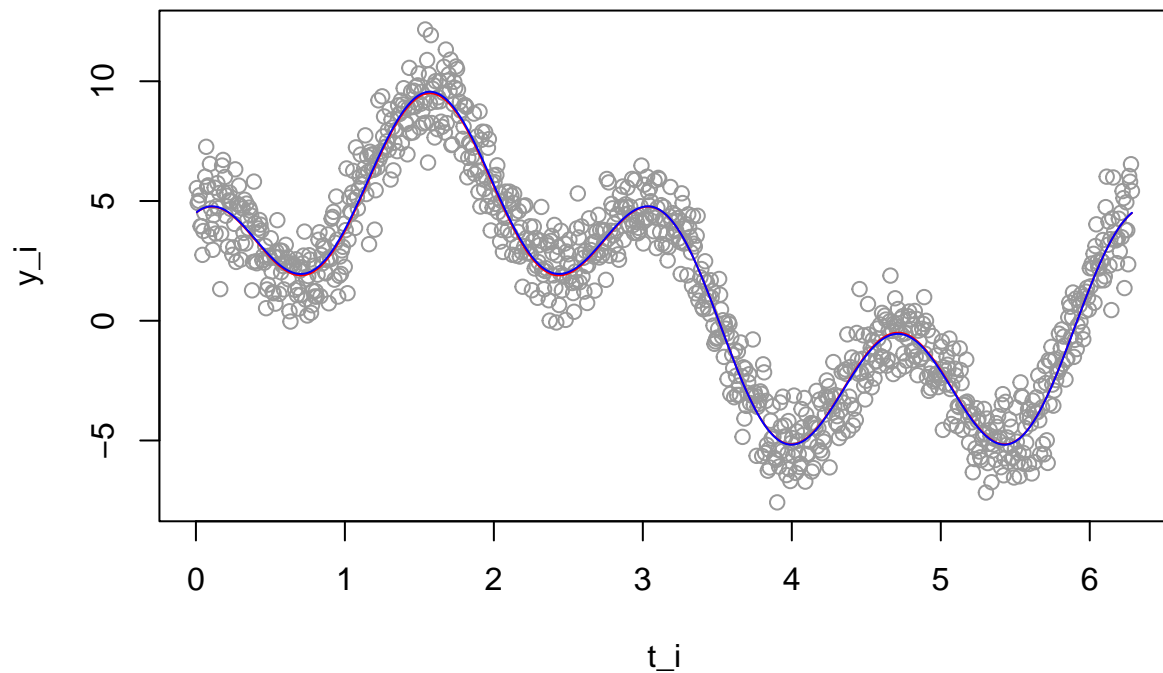
```
solve(P) %*% X_T %*% y
```

```
##         [,1]
##    1.516182
## x 5.054882
## z 2.991464
```

##1번-(7)

```
B_h = solve(P) %*% X_T %*% y
Q= X %*% B_h
```

```
plot(t_i,y_i,col='gray60')
lines(t_i,Y,col='red')
lines(t_i,Q,col='blue')
```
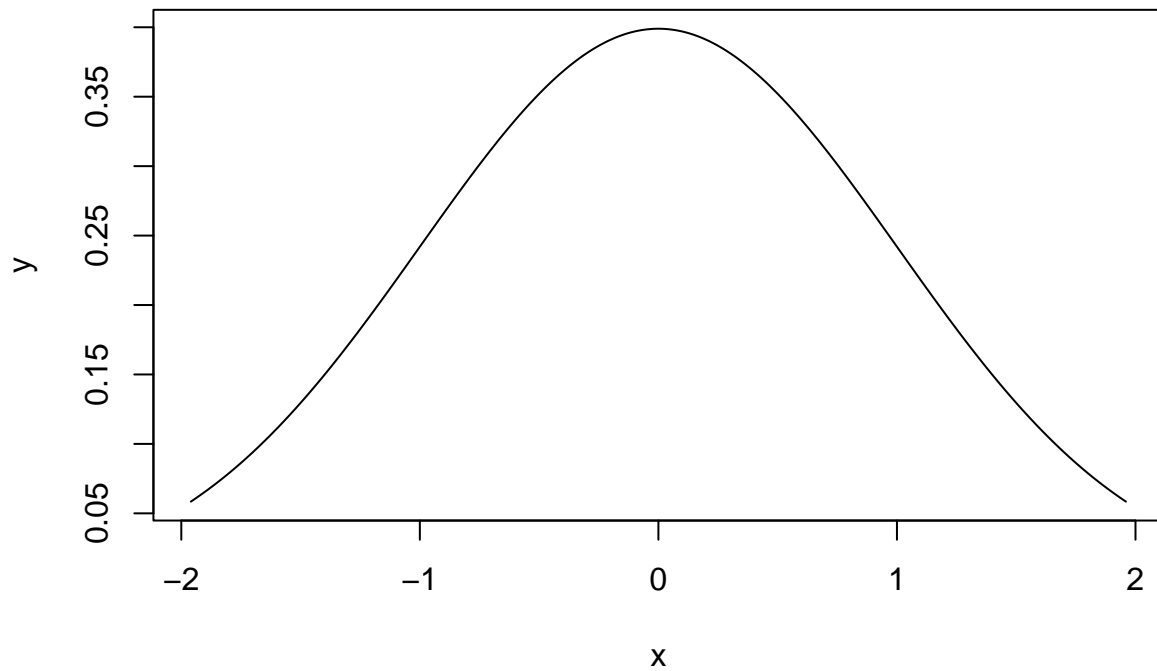
##2번-(1)

```r
x=seq(from=-1.96, to=1.96, by=0.01)
y=(exp((-x^2)/2))/((2*pi)^(1/2))

plot(x,y,type='l')
```
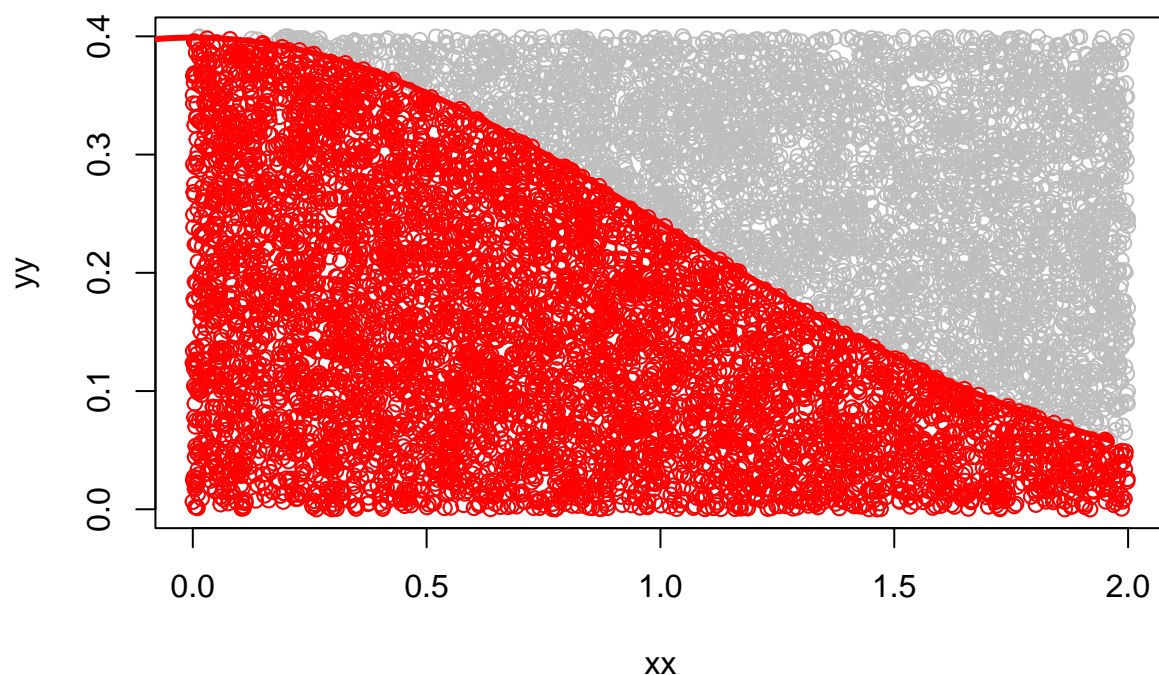


```r
xx=runif(10000)
xx = xx*2
yy=runif(10000)*0.4
plot(xx,yy)
lines(x,y,col='red', lwd=3)
```
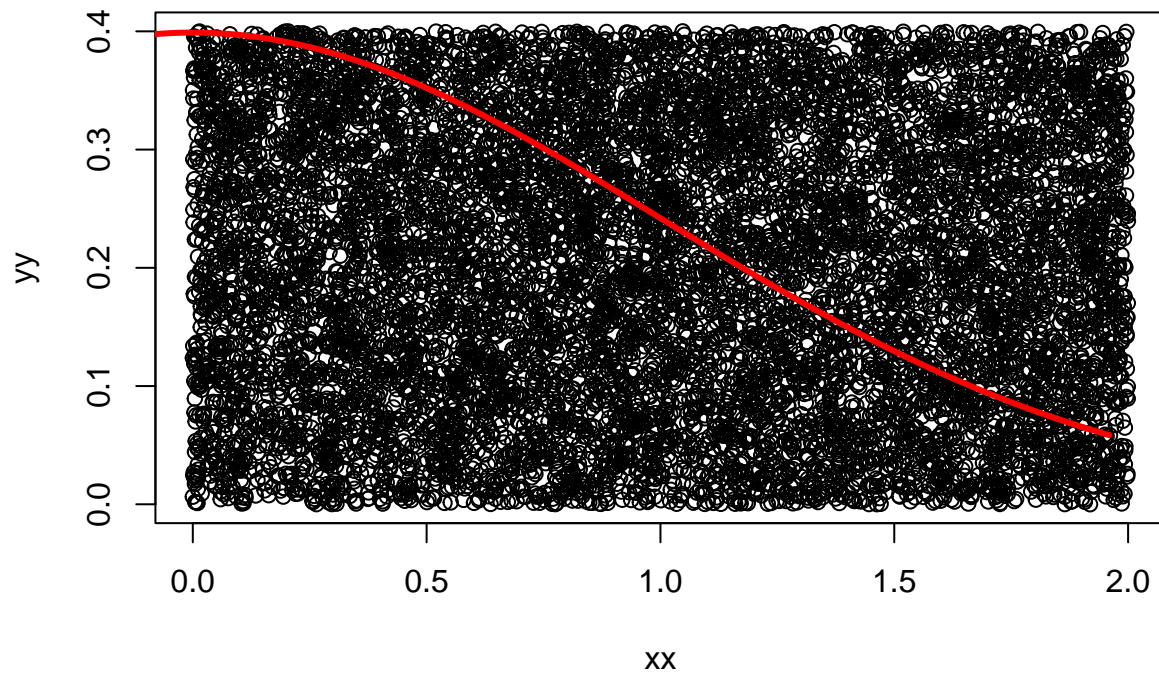
```
test = function(xx,yy){
  yy < (exp((-xx^2)/2))/((2*pi)^(1/2))
}
```

```
tst = c()
for (i in 1:10000) tst[i] = test(xx[i], yy[i])
plot(xx,yy,col='gray')
lines(x,y,col='red',lwd=3)
points(xx[tst],yy[tst],col='red')
```

```
sum(tst)
```

```
## [1] 5981
```

```
(5915/10000) * 0.8
```

```
## [1] 0.4732
```

##2번-(2)

```
rnorm(1000)
```

```
##    [1] -1.180944586  0.928174524  0.458723928  0.153651468  0.561914401
##    [6] -0.638803565  1.443836585  0.546606488  1.252921763  0.378411438
##   [11] -0.915550032 -0.685874346 -1.453749621  0.125788303 -1.023983484
##   [16]  0.510934817  0.627379193  0.617407752 -2.178070671 -1.561723333
##   [21] -1.301501550 -0.359249854  0.762561526 -0.809067132  0.376880504
##   [26]  0.449125060  1.351976818  0.473362725  1.500621177  0.307589357
##   [31]  1.063038942 -0.876010385  1.476763810  0.106410548  1.386172722
##   [36]  1.742943184  0.190630409  1.672166312  0.174451674  0.718922095
##   [41] -1.091296068  0.494298180  0.081622045 -0.075932985  0.297477647
##   [46]  1.582198087 -0.046314149  1.095001885 -0.230769162 -0.569421177
##   [51]  0.885050080  0.883182314 -1.775329084  0.719824522  1.072715733
##   [56] -0.338677436  0.687714498 -1.335144664  0.777561497 -1.128576378
```

```
##    [61]  1.590280520 -2.583353282 -0.510998994 -0.270193782  0.620943717
##    [66] -2.371700074 -0.215088795 -0.048189196  1.042085688 -0.938161046
##    [71] -2.033430411 -0.144328625  1.675547925 -1.132901250 -0.293748534
##    [76]  0.302875563  0.228869079  2.080019062 -0.574114342  1.310765412
##    [81]  1.085969732 -1.068538844 -0.940833937 -0.042784636 -1.100790908
##    [86]  0.862752362  1.249132152 -0.894724453  0.618905936  2.574680233
##    [91] -0.975346261 -0.732079004 -0.232061950  0.266837415  0.298604915
##    [96] -1.957492556  0.247590909  0.362025382 -1.509868205  1.119425857
##   [101] -0.535835395 -0.089816284  1.095927958 -0.112494755 -0.858499249
##   [106] -0.001017659 -0.234282502  0.340157244  0.873256269 -1.650235903
##   [111] -1.399545165 -0.744174076 -1.419646568 -0.330208375  0.650617542
##   [116]  0.096729447 -0.736174313  0.726076448  1.155647166  1.574291191
##   [121] -1.867512584 -0.301677640  0.725219043 -1.114553194 -1.150913407
##   [126] -1.244212181  0.810200545  0.756576581 -0.852160180  0.944851019
##   [131]  0.909592277  0.298770412 -0.444949378 -0.520566692 -0.902405530
##   [136] -1.139491230 -0.372596046 -0.177819036 -0.996720185 -0.168154082
##   [141]  0.269956228  1.314752424  0.447094988 -1.569102999 -0.596879682
##   [146]  1.808779612  1.010560673 -0.567067537 -0.147943893 -0.555668802
##   [151] -0.170834027 -0.399358429  0.349231664 -0.175110395  0.077890966
##   [156]  0.045452837 -1.388176164  0.003179577  1.723833945 -1.055198085
##   [161] -1.272590386  0.967522190 -0.167314417  0.702750252 -0.612113530
##   [166] -0.606126075 -0.071628377 -1.321670494  0.724709104  2.179652314
##   [171] -0.843855917  0.041629920  0.290622999  0.342343252 -0.256514941
##   [176] -1.402777773 -1.840902561 -0.019395750 -1.329748614 -0.646373686
##   [181]  0.832179104 -0.669917194  0.047267522 -1.369709465  1.314017709
##   [186]  0.569331538  0.338304033 -1.591696538  0.876467047 -0.943275600
##   [191] -0.724994435  0.629778926 -1.969869803 -0.188013384  0.196804076
##   [196]  0.395064937 -1.084450114 -1.304474265  0.075674116 -0.758950991
##   [201]  0.570516493 -0.884899727  0.605155434 -0.902866353 -0.610545019
##   [206] -0.233465941 -0.191442471  0.412393670 -0.159965589  0.446184608
##   [211] -1.008340816 -0.729330997 -0.205992933  0.810697652  1.041298053
##   [216] -0.381028536 -0.460086970 -0.457211752 -0.794508971  0.877308816
##   [221] -1.232643712 -0.151444958 -0.965374567 -0.386733923 -0.503558815
##   [226]  0.105075160  0.130335343 -0.476172926  1.225915765  1.552152681
##   [231]  1.004853371 -1.221597057 -1.740630214 -1.442802289 -0.349399609
##   [236] -1.234101378  1.767406790  0.622489688 -0.533315785 -1.690296407
##   [241]  1.469249034  0.392605204  1.786171057 -1.179884067 -0.903456022
##   [246] -0.481624168  0.498839163  1.064234523 -0.916663166 -0.067229034
##   [251] -1.007998846 -0.149216666  0.282489171 -2.159921057 -0.140800676
##   [256] -0.606526971 -0.066472889  1.469090428 -0.366752644 -0.980326838
##   [261] -0.319821664  0.749664445  0.618242435  1.191627654 -0.392050105
##   [266] -0.251035123  0.578515372 -1.446484486  0.362093655 -0.384022318
##   [271]  0.732397618 -1.196317671 -0.295732809 -0.000192079 -0.594839094
##   [276] -0.137004728  1.443770909  2.060247809  1.160620127 -1.114582585
##   [281]  0.385008574  0.235262650 -1.584561701 -0.410999720  0.028188152
```

```
## [286] -0.175211693 -0.137464402 -1.795221684  0.326676912 -1.745369623
## [291] -0.587905946  0.416363010  0.003525660 -0.170247050 -0.280672919
## [296] -0.800149026  1.060866370  1.222253023 -0.384886378  2.085961288
## [301] -1.965928492  0.147572390 -0.335552071 -0.539558127  1.556579530
## [306]  0.789330629 -1.495171583 -1.370197699  1.129548854  0.467648404
## [311] -0.235423106  2.051321931 -0.559187813  0.479364982  0.528273750
## [316] -0.033835382  1.620947583 -0.751256733  0.193028651  1.411188336
## [321] -0.978517771  0.188373735  0.707663571  1.286101607 -1.129839880
## [326]  1.039183761  0.642126532 -0.441693018 -0.274449274  1.347890471
## [331]  1.162361221  0.132096526 -0.476280176 -0.571772184  0.809979477
## [336] -0.014606910  0.294780289 -1.286339265 -1.040461352 -0.282208293
## [341] -0.439367895 -0.425605833  0.493829312 -1.683434969 -1.043549735
## [346] -1.997046587 -0.883445910  0.165899799 -0.702421255  0.342261685
## [351]  0.329033470 -0.289372972 -0.148973184 -0.957351182 -0.273874658
## [356] -0.573147225  0.018972017 -0.593827472 -2.014352295 -0.192991198
## [361]  0.862293911  0.382212408  0.720436476 -0.267360833  0.466631360
## [366]  1.026232413  0.347520830 -0.267485313  0.406681803  0.587848116
## [371]  0.036456787 -2.542887847  1.278443895  0.771250849  0.658994756
## [376] -1.436555336 -0.311143031 -0.678377683  0.228670511  1.333583356
## [381]  0.140356591  0.390454669  0.436209167 -0.341565044  0.309140657
## [386]  1.704948868 -1.983479953  0.609027436  1.307277997  0.553843291
## [391]  0.747227408  0.334164785 -1.216873921 -0.672688426 -0.087930054
## [396] -0.044026723  1.256247845 -1.531811927  0.521770583 -0.179626478
## [401]  1.109730429  1.020656401  1.041172891  1.305071260 -0.608513651
## [406] -0.569338529  1.570889057 -0.555912508  0.347208523  0.636592407
## [411] -1.198660047  0.113150734  0.535705672 -0.559152571  0.399422309
## [416] -0.080574221  0.946354096 -0.420557375  0.884946546 -1.371838460
## [421]  0.882917659 -0.790981613 -2.265825980  1.343860380 -0.146915043
## [426]  0.643097739 -0.417522309  0.255445229  0.846971884 -0.778646427
## [431]  1.093973871 -0.520123517  2.611285676  1.578296180  0.890731726
## [436]  0.720911715 -0.631293266 -0.497151439 -0.217033304 -0.331865552
## [441] -0.831729547 -0.251644976  0.686300864  1.415322297  0.818370841
## [446]  1.077963526  0.304608763 -0.473636867  0.628233083  0.586300651
## [451]  0.345340570 -0.422998098  0.072687863  0.128877166  1.146663176
## [456]  0.429124068  1.410018816  0.474607200 -0.070127817 -0.695839177
## [461]  0.506288540 -0.614854784  1.257046229  1.641645772  0.477550414
## [466] -2.432666384 -0.141226959  0.619664718 -0.082292907 -0.275325208
## [471]  1.896421439  0.272652968 -0.510441769 -0.085948678  0.282817255
## [476]  1.548615070 -0.179834997  0.470457787 -0.543798679 -0.293017851
## [481] -0.256161622  1.007106823  0.829252399  0.843813088  0.603940517
## [486] -0.307035651  1.670829991 -0.135275243 -1.319514262  0.853857557
## [491] -0.453035031  1.216023942 -0.495172308 -0.994990251 -1.614827715
## [496] -0.840281718 -0.082055864 -0.545158153 -0.041422385  0.474273427
## [501] -1.414095234  0.319978414 -0.537843199 -0.223315734  0.297080302
## [506]  1.023354239 -3.059107422 -0.408588085 -0.570564258  1.094330250
```

```
##  [511]  0.160765340 -0.367238528 -0.799978370 -1.011770306  1.416762956
##  [516] -0.157125865  0.475766707 -0.497432303 -1.411228194  1.009202840
##  [521]  0.635823998  0.539479524  0.744758875 -0.840639067 -1.940511853
##  [526]  0.078588280  0.209983609 -0.317439792  1.100585815  0.570636424
##  [531] -1.127565820  0.020451331  0.866284321  1.441823012  1.166541141
##  [536] -1.127746640 -1.614797462  1.312692442 -1.392630780  1.642905952
##  [541]  1.025191526  0.214750764 -1.603634955  1.568127282  0.310249143
##  [546] -0.148047924 -1.694453155  0.524454706  0.414682929  0.481756610
##  [551] -0.478621501  0.490288819  0.952156157 -3.060531821  0.490079503
##  [556] -0.077096382 -0.440046873 -0.815734499  0.633030680  0.545976484
##  [561]  0.487980281 -0.406282672  0.312864331 -0.393532235 -0.028044757
##  [566] -1.035249389 -0.296364217  0.847510134 -1.398342183  0.423477504
##  [571]  1.472734788  1.203590547  1.517243119  2.547845944  0.112328420
##  [576]  0.017838177  0.171612611  0.512254233  0.280273217  1.004400241
##  [581] -1.358870236 -2.106337839  0.067629558 -0.212693498 -0.010320251
##  [586]  1.615958351  0.029670259 -0.331871230  0.828489072 -2.607113119
##  [591]  0.410147556  1.010629720  0.536964851 -0.790681226  1.005092865
##  [596] -1.205977968 -0.986959095 -0.789409405 -1.019001502 -1.559401577
##  [601] -0.322569281  1.668319299 -1.932236331  0.344584324  1.425249328
##  [606] -1.147825293  0.110363329  0.293132912 -0.327511318  0.710184411
##  [611] -1.149093630  0.097436086  0.895604895 -0.781796726  0.668918944
##  [616] -0.323706193 -0.235825470 -0.843855448 -0.673046331 -1.011810511
##  [621]  0.922049657  1.971414581 -0.177596624  2.666340771  0.585289821
##  [626] -0.530800234 -1.540840964 -0.432772707  0.232900763 -0.529286824
##  [631] -1.107705322 -0.831548572 -0.929618100  0.229097618  0.180001740
##  [636] -0.683895387 -1.649355259 -0.054109669 -0.308246240 -0.141914794
##  [641]  0.412047754 -0.973234869 -0.838807373  0.260500774 -1.430172911
##  [646] -1.106202517 -1.612418262  0.199042415  0.888938015 -0.472821260
##  [651]  1.742315371  0.265155625 -0.740253576 -0.592738679  0.984486082
##  [656]  0.260818258  3.143741808  0.495849467  0.160236613 -1.038669253
##  [661]  0.155919984 -0.582184392  0.547325043  1.812999941 -0.285543815
##  [666] -1.492589064 -2.106942839 -0.639231954  0.522504016  0.564723225
##  [671] -1.297772214  0.787167802  0.828976582  0.620626028  1.851702660
##  [676] -0.820488354 -0.161050938 -1.077796708 -0.138741091  1.104077582
##  [681] -1.302599329 -0.293175059 -0.309123626  1.313909211 -1.800049477
##  [686] -0.171088712 -0.877763313 -1.451159838  1.432180773  1.239158333
##  [691] -0.475868503 -1.046784514 -2.981458707  0.380800408  1.211756915
##  [696] -2.030636193  1.559431985  0.585282807 -0.271381492  0.357094230
##  [701]  0.656003167  0.951822788  0.813062840 -0.201079404  0.246522210
##  [706] -0.076594249  1.780064600 -0.780871872 -0.293226735 -0.208786837
##  [711] -0.876948173  0.086985811 -0.287893916  0.044364808 -0.043387444
##  [716]  0.805210482 -0.354311518 -0.485915043  2.504985862 -0.594254525
##  [721] -0.167821996 -0.876016764  0.404654910 -1.197364852 -1.174263793
##  [726] -0.054821495  0.495760812  1.600095879  1.826329572 -0.694379893
##  [731] -0.404795905  0.241263633  0.296693916 -0.660077467 -1.131807018
```

```
##  [736]  0.217676598 -0.392259635 -0.173899822 -1.061570984 -0.254785216
##  [741] -1.534429111  1.783262523 -1.297046619  1.323403521  1.124785241
##  [746]  1.930456746  0.055526599  0.819790231 -3.681583452  0.016637769
##  [751] -0.859638487  1.995156067 -1.291534010  1.230335443 -0.456117142
##  [756]  0.601120118 -0.331702759  1.343719098 -1.725172720  2.146854685
##  [761]  0.782658536  0.376455517 -1.792525303 -0.420572037  2.267329888
##  [766] -1.230173106 -0.529541616 -0.859130709 -0.383360868  0.479203994
##  [771]  0.305776901  0.415191706  0.232717168 -1.634599915  2.303433221
##  [776]  0.891636514  0.572703133  1.072217134 -0.634995080  1.066750564
##  [781] -0.015295052 -0.378750407 -1.142426578 -2.038414049 -0.015484897
##  [786] -0.869442972  1.468051642  0.163282192  1.073615411  1.717227459
##  [791]  0.433653092 -1.806767474  2.002513369 -0.437289618 -0.883007365
##  [796] -1.948649079  0.867731083  1.419315324  1.878558195 -2.958225311
##  [801]  1.474089643  1.232486520  1.690783436 -1.405907972 -1.495608392
##  [806] -0.994923161  0.717195827 -0.383274407 -0.757702460 -0.235501988
##  [811]  1.475844229 -0.806211264  0.499302769 -0.878410777 -0.477018146
##  [816]  0.316945391  2.066514380 -0.870865364  0.215012748 -1.874047803
##  [821] -0.125809366  1.134890570 -0.526587568 -0.417850312 -0.156317803
##  [826]  0.706280003 -1.239649515 -0.027221988  2.885635444 -0.560647376
##  [831]  1.574511104 -0.962980152  0.421436974 -0.838240022 -0.034409372
##  [836]  0.319150120  0.420915399  0.892454268 -0.138984039 -0.936931653
##  [841] -3.014001816  0.091451418  0.790060499  0.287229138  1.930985266
##  [846] -0.701625583  0.275120371 -0.271469033 -0.776609210  0.755591979
##  [851]  0.125530492  0.514214482  0.043906311  0.772933359  0.922527108
##  [856] -0.421536255  0.956606619 -1.458380677 -0.947104543  0.584510392
##  [861]  0.655860898 -0.740534652  0.909447088  1.177159454  0.009646626
##  [866] -0.561636477 -1.554625763  2.350429850 -2.897655431  0.130380153
##  [871] -0.228056879  1.599527081  0.719703114  0.535254311  0.498707419
##  [876]  1.616912082 -1.275370519  0.438109889 -0.402270190 -1.004254513
##  [881]  1.433941010  1.647012771 -0.739951817 -0.053358668 -0.948897469
##  [886]  0.522107585 -0.754633109  0.077455699 -1.273327547  0.380320731
##  [891] -1.628814264 -0.358141537 -0.247301042  0.583538870 -1.949689857
##  [896] -1.261323472  0.362208879  0.791994193 -1.538597509  0.050379001
##  [901]  1.261922124  0.161008279  1.583828088 -0.684521118 -0.409226945
##  [906]  0.799041778  0.809280126 -0.241394178  0.294162103  0.294831285
##  [911]  0.579023355 -0.303637866 -0.856404230 -0.243378359 -0.031544173
##  [916] -0.675316308  0.008765601  1.073174425  0.100549247 -1.168777159
##  [921] -1.066124465  1.560628360  0.114561350  0.207635861  0.121868137
##  [926]  0.288062720  0.332409697 -1.566352777 -0.336472262  0.913259689
##  [931]  0.699797250  0.019445616  0.274901736 -1.221977038  0.664154731
##  [936]  0.010592869 -0.766047922 -1.158117148  0.350630386  2.519464134
##  [941] -0.152462880  0.058013975 -0.386829394  0.852994701  0.879648419
##  [946] -0.251385718  1.053353659 -1.772520689 -2.128000389  0.079727105
##  [951] -0.840192207  1.812604646 -0.889123695  1.328128592  1.026914135
##  [956]  1.891447806  1.979737992  0.667932860 -0.366830928  0.199776421
```

```
##   [961] -0.608285109 -0.451853209 -0.351920925  0.101376028  2.080365738
##   [966]  0.858525810 -0.780790708  1.736967859 -0.088680833  0.207400056
##   [971] -0.280139463 -0.503201554 -0.473080892  0.119271594  0.101903457
##   [976] -0.124434880  0.038377089 -2.154695187  0.097780804  0.774679911
##   [981] -0.759013197 -0.100713228  0.996437477  0.242103790 -1.041436723
##   [986] -1.558778252 -0.676403654  1.180831224 -0.171291658 -1.164594410
##   [991] -0.139140294 -1.107527567 -0.888750294  0.066651502 -0.142628571
##   [996] -1.158290472  0.479371366 -0.553086451  0.296397976 -2.272942163
```

```
1000*0.4732
```

```
## [1] 473.2
```

##4번-(1)

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v dplyr   1.0.7
## v tidyr   1.1.4     v stringr 1.4.0
## v readr   2.1.1     v forcats 0.5.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
df = read_csv('https://raw.githubusercontent.com/guebin/2021IR/master/_notebooks/covid19
```

```
## Rows: 12294 Columns: 5
## -- Column specification ------------------------------------------------------
## Delimiter: ","
## chr (1): prov
## dbl (4): year, month, day, cases
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
x_1=filter(df,year==2020)
y_1= (x_1 %>% select(cases))
```

```
sum(y_1)
```

```
## [1] 60726
```

```
x_2=filter(df,year==2021)
y_2= (x_2 %>% select(cases))
```

```
sum(y_2)
```

```
## [1] 396886
```

##4번-(2)

```
x_3=filter(df,year==2020,month==2,day==1:15)
```

```
## Warning in day == 1:15: 두 객체의 길이가 서로 배수관계에 있지 않습니다
```

```
x_3
```

```
## # A tibble: 18 x 5
##     year month   day prov  cases
##    <dbl> <dbl> <dbl> <chr> <dbl>
##  1  2020     2     1 강원      0
##  2  2020     2     2 세종      0
##  3  2020     2     3 대전      0
##  4  2020     2     4 인천      0
##  5  2020     2     5 부산      0
##  6  2020     2     5 제주      0
##  7  2020     2     6 경북      0
##  8  2020     2     7 전북      0
##  9  2020     2     8 충북      0
## 10  2020     2     9 경기      3
## 11  2020     2    10 울산      0
## 12  2020     2    11 광주      0
## 13  2020     2    12 대구      0
## 14  2020     2    12 검역      0
## 15  2020     2    13 서울      0
## 16  2020     2    13 경남      0
## 17  2020     2    14 전남      0
## 18  2020     2    15 충남      0
```

##5번-(1)

```
cumprod(1:7)
```

```
## [1]    1    2    6   24  120  720 5040
```
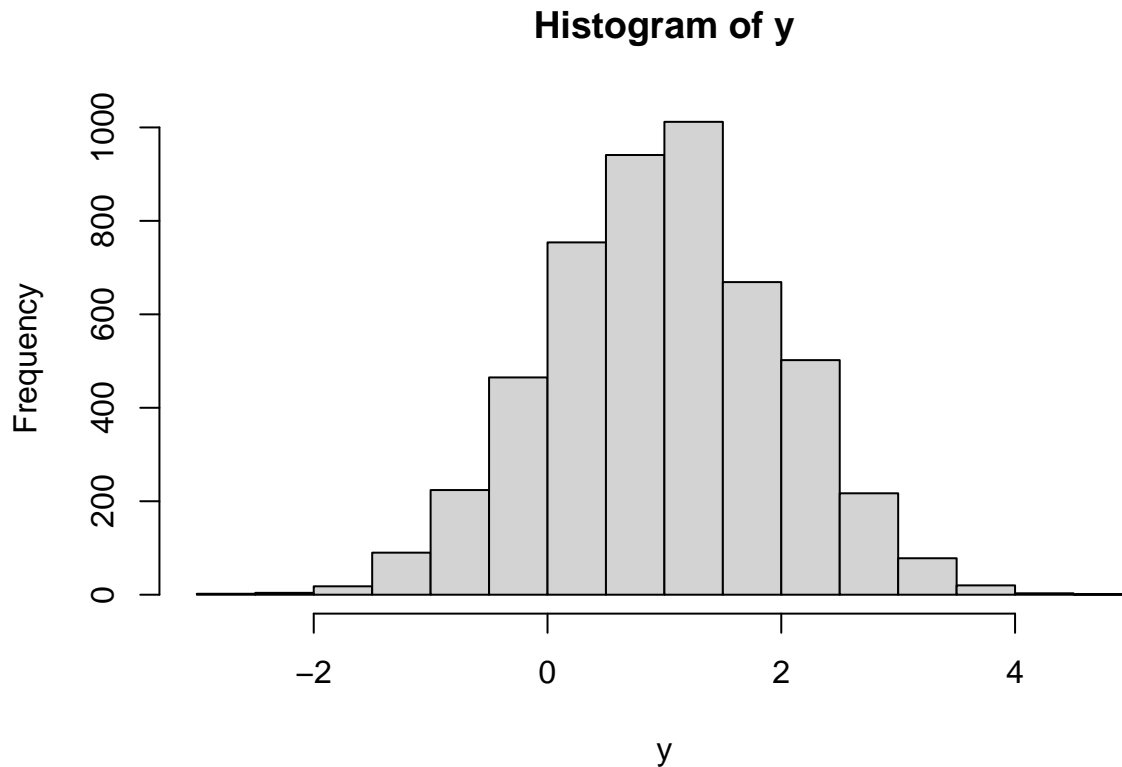
##5번-(3)

```
epsilon=rnorm(1000)
if(epsilon>0){
  print(TRUE)
}else{
  print(FALSE)
}
```

```
## Warning in if (epsilon > 0) {: length > 1 이라는 조건이 있고, 첫번째 요소만
이 사
## 용될 것입니다
```

```
## [1] FALSE
```

##5번-(5)

```
y=rnorm(5000,1,1)
hist(y)
```

Histogram of y


```
pi <- function(n) {
  counter <- 0
  for (i in 1:n) {
      coordinates <- runif(2, min=-1, max=1)
        if (sqrt(coordinates[1]^2 + coordinates[2]^2) < 1) {
            counter <- counter + 1
            }
  }
  return(4 * counter / n)
}
```

##6번-(3)

```r
pi(100000)
```

```
## [1] 3.14444
```

```r
A<-matrix(c(1,2,3,4,2,2,1,0,0,1,-1,0,3,1,-1,3),ncol=4,byrow=T)
A
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    2    3    4
## [2,]    2    2    1    0
## [3,]    0    1   -1    0
## [4,]    3    1   -1    3
```

```r
b<-matrix(c(1,9,4,7),ncol=1)
b
```

```
##      [,1]
## [1,]    1
## [2,]    9
## [3,]    4
## [4,]    7
```

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:
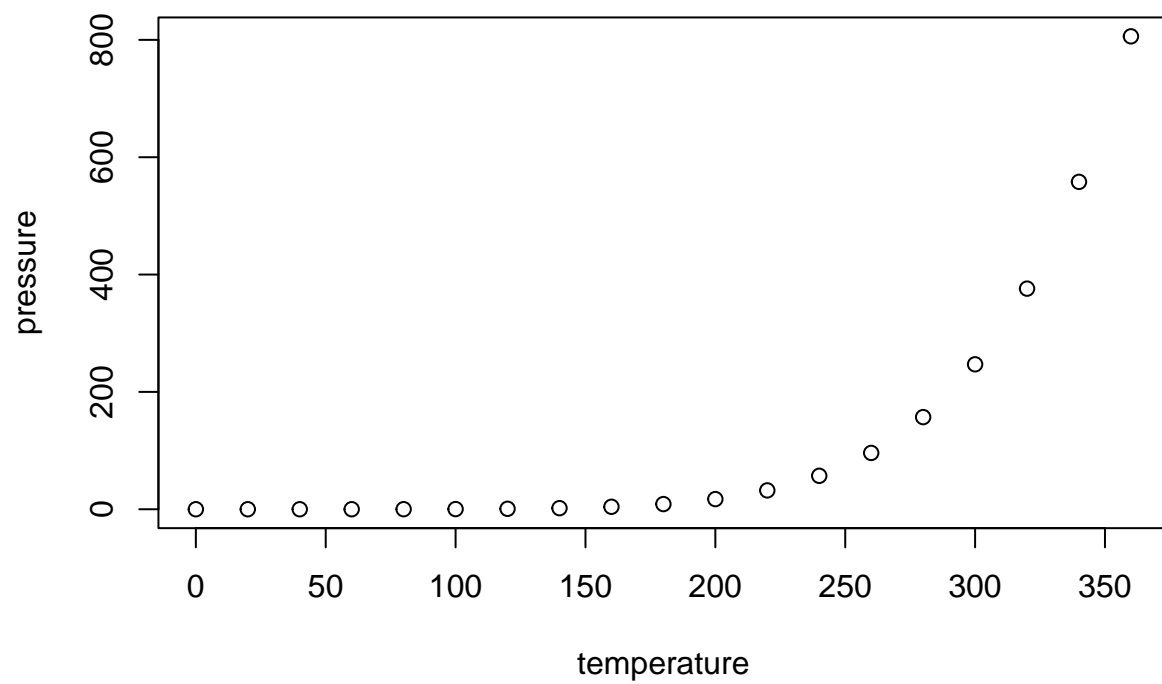
```r
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

Including Plots

You can also embed plots, for example:

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of
the R code that generated the plot.