HW1

```
---
  ### Name: Tianlang Yang
  ### MA 415
  ### Assignment 1
---
#1.
#(a)
1:20
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
```

```
#(b)
20:1
```

```
##  [1] 20 19 18 17 16 15 14 13 12 11 10  9  8  7  6  5  4  3  2  1
```

```
#(c)
append(1:20,19:1,after = 20)
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 19 18 17
## [24] 16 15 14 13 12 11 10  9  8  7  6  5  4  3  2  1
```

```
#(d)
tmp <- c(4,6,3)

#(e)
rep(tmp,10)
```

```
##  [1] 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3
```

```
#(f)
rep(tmp,10,31)
```

```
##  [1] 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4
```

```
#(g)
rep(tmp,c(10,20,30))
```

```
##  [1] 4 4 4 4 4 4 4 4 4 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 3 3 3 3 3
## [36] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
```

```
#2.
x <- seq(3,6,0.1)
exp(x)*cos(x)
```

```
##  [1] -19.884531 -22.178753 -24.490697 -26.773182 -28.969238 -31.011186
##  [7] -32.819775 -34.303360 -35.357194 -35.862834 -35.687732 -34.685042
## [13] -32.693695 -29.538816 -25.032529 -18.975233 -11.157417  -1.362099
## [19]  10.632038  25.046705  42.099201  61.996630  84.929067 111.061586
## [25] 140.525075 173.405776 209.733494 249.468441 292.486707 338.564378
## [31] 387.360340
```

```
#3.
#(a)
(0.1^seq(3,36,3))*(0.2^seq(1,34,3))
```

```
##  [1] 2.000000e-04 1.600000e-09 1.280000e-14 1.024000e-19 8.192000e-25
##  [6] 6.553600e-30 5.242880e-35 4.194304e-40 3.355443e-45 2.684355e-50
## [11] 2.147484e-55 1.717987e-60
```

```
#(b)
((2^seq(1,25,1))/seq(1,25,1))
```

```
##  [1] 2.000000e+00 2.000000e+00 2.666667e+00 4.000000e+00 6.400000e+00
##  [6] 1.066667e+01 1.828571e+01 3.200000e+01 5.688889e+01 1.024000e+02
## [11] 1.861818e+02 3.413333e+02 6.301538e+02 1.170286e+03 2.184533e+03
## [16] 4.096000e+03 7.710118e+03 1.456356e+04 2.759411e+04 5.242880e+04
## [21] 9.986438e+04 1.906502e+05 3.647221e+05 6.990507e+05 1.342177e+06
```

```
#4.
#(a)
a <- seq(10,100,1)
x = a^3
y = 4*(a^2)
sum(x+y)
```

```
## [1] 26852735
```

```
#(b)
b <- seq(1,25,1)
sum((2^b/b)+(3^b)/b^2)
```

```
## [1] 2129170437
```

```
#5.
#(a)
paste(c("label"),seq(1,30,1),sep = " ")
```

```
##  [1] "label 1"  "label 2"  "label 3"  "label 4"  "label 5"  "label 6"
##  [7] "label 7"  "label 8"  "label 9"  "label 10" "label 11" "label 12"
## [13] "label 13" "label 14" "label 15" "label 16" "label 17" "label 18"
## [19] "label 19" "label 20" "label 21" "label 22" "label 23" "label 24"
## [25] "label 25" "label 26" "label 27" "label 28" "label 29" "label 30"
```

```
#(b)
paste(c("fn"),seq(1,30,1),sep = "")
```

```
##  [1] "fn1"  "fn2"  "fn3"  "fn4"  "fn5"  "fn6"  "fn7"  "fn8"  "fn9"  "fn10"
## [11] "fn11" "fn12" "fn13" "fn14" "fn15" "fn16" "fn17" "fn18" "fn19" "fn20"
## [21] "fn21" "fn22" "fn23" "fn24" "fn25" "fn26" "fn27" "fn28" "fn29" "fn30"
```

```
#6.
#(a)
set.seed(50)
xVec <- sample(0:999, 250, replace=T)
yVec <- sample(0:999, 250, replace=T)
yVec[2:250]-xVec[1:249]
```

```
##   [1]  163 -122  317 -146  417  393  249 -489  741  771   81  402 -549  338
##  [15]  583 -403  -67  217  307 -121 -269   36 -706 -563  102   48  397  297
##  [29]  -45 -152  497  405  339 -400  499  -89  211 -670   87   74  554  149
##  [43] -183  612  193 -453  -70 -141  127 -709 -708 -722  -64  388 -184 -212
##  [57]  242  430  275  672 -150  275  -96 -255  512  577  264  439  149 -916
##  [71]  374 -889 -332  324 -553  394  -87  -75  345 -735  -55  100  -40   15
##  [85]  279  409  790 -547 -487 -399 -619 -168 -185   19  645  551  227 -366
```

```
##  [99]  242  147  247 -499 -614  758   63 -227  247  379 -472  566 -762  152
## [113]  493  360   69  190  544 -176  216 -676 -205  782 -109  189 -233  505
## [127] -219  288  -57  487  256  300 -192 -263  704  674  217  280   17  -68
## [141]  259  612 -127    1  545 -231 -191 -338  333  495  -21   -4  294 -668
## [155] -814  420  793  631  -67  655  143  611 -220 -518 -285  327  523  -13
## [169] -679 -241   39  193  342  588  469   68  895 -658  232 -331   27  441
## [183] -733 -182 -399   79 -469  371  475  265 -407  211   59 -974  -90  218
## [197]  396 -486 -963 -327  425  220  128  235  294 -107 -365  146 -588  449
## [211] -434  221  846  386 -910  161  206  109  712 -334 -434    7  640 -350
## [225]  923  353 -579  225  327  410  568 -195  -83  154 -486 -195  667 -144
## [239]  272  410  546  380 -559  414  674  193  222  -92  553
```

```
#(b)
sin(yVec[1:249])/cos(xVec[2:250])
```

```
##   [1]   0.88603405  -1.44184825   0.82807258  -1.61591717  -0.86017343
##   [6]  20.26356465  -0.79930406   1.72414444  -0.08094240  -0.74895634
##  [11]  -2.59866958  -0.37361045  31.11471579   0.12355916  -0.35925226
##  [16]  -0.90743608   0.34374436   5.78205917  -2.57418558  -0.78661325
##  [21]  -0.59855406   0.98936263   0.33042931  -1.75124647  -0.59435547
##  [26]   1.05374692   0.65497397  -0.11596582  -0.97176537   0.57180267
##  [31]   0.75799030  -0.49259143  -0.99433357   0.05377148  -3.77616264
##  [36]  20.54902944   0.77784817   1.28146891  -0.51650728   6.66902699
##  [41]  -0.92970072 -10.93066299  -3.13102962  30.87943423  -1.14281543
##  [46]   0.36757630   1.18479716   0.94594159   0.93339520   0.93632658
##  [51] -11.05384468   2.76893270   0.97488334  -0.08932225  -1.33616578
##  [56]  -3.30065552   0.62663162  -1.96486337   0.08653876   0.56695489
##  [61]  44.07630714  -1.11764853   0.11230330  -0.46073106  -0.13860882
##  [66]   0.84026052   2.64708780  -1.63174570  -9.63022830  -2.15553419
##  [71]  -0.42770826   3.24955062  -4.23453154   0.93067452  -0.88388390
##  [76]   0.69339350   1.72841015  -8.22082884   1.69276461   1.02074555
##  [81]  -3.21968328  -0.90739226   1.11331935   0.59579467   0.19571363
##  [86]  -0.17975474   4.38929818   0.64431266  -1.54509170  -0.26536991
##  [91]  -0.81679156   1.34164181  -1.03400420  -1.33639979  -0.44444499
##  [96]   0.96777754  -0.09545121  -0.63686070  -2.30844090  -0.11384497
## [101]   1.08800453   1.06851885  -0.30428029  -1.77044888  -1.45269351
## [106]   0.97943716  -2.15021752   1.56128032   0.61018741   5.59692239
## [111]  -1.03020002  -1.14632240  -0.81548097   0.95359082  74.12815803
## [116]  -0.20329495  -0.08875385  -0.76023984  -0.42372635  -0.68385723
## [121]   1.28860542   0.94117702   1.89561343   0.69369539   4.15021756
## [126]  -1.08026240   1.26615554   0.02147428   3.32694398   0.22930300
## [131]   1.14217476   0.73847767   8.72339712 -17.15727240   0.90435970
## [136]   1.07791792   0.75391899  -0.26297571   0.83894657  -1.22542984
## [141]  -0.57277292  -1.22429033   2.10719833  -1.35745285  -0.84117115
## [146]  -0.69663176  -0.99207337  -1.17363312  -5.50814669  -1.12309426
## [151]   0.60767585   0.32903697  -0.08845387  -4.42251048  -1.31360561
## [156]  -1.05268827  -1.45007537  -1.03184453   0.38034305   2.06381128
## [161]  -1.64568068   0.47938401  46.18666528   1.75988821  14.03349520
## [166]   1.99884446  -1.02170635   1.02445028  -0.15250370  -1.11793279
## [171]  -4.12228606   1.02355677   0.89546497   0.74732250  -2.09533197
## [176]  -2.40630344  -0.73530615   0.90759126  -0.87474163  -4.22536917
## [181]  -2.04450866  -7.41320483   0.03607946  -0.85674969  -0.85648584
## [186]   2.58973778   8.68248704  -0.74202802   1.07347586   1.37638585
## [191]   1.73104746  -0.57596355  -0.49915725   0.11786229  -0.45584137
## [196]  -0.97726281  -6.86428063  -0.60929448  -0.72132361   0.00000000
```

```
## [201]   1.00734878   4.20789995  -0.81616263  -1.72455176  10.00784534
## [206]   0.71310632   8.77005056  -0.64297796   0.24086573  -6.12424634
## [211]   0.94848253   9.22132979  -5.85933168  -0.77292827  -0.85749485
## [216]   0.80000340 -10.45187777   2.91489552   0.86914823   0.93956496
## [221]   1.15020196  -4.25009579  -0.97278301   1.05669698  23.96919924
## [226]  -0.11659711   0.58615433  -1.23512544   1.08111948   3.37846777
## [231]   0.96204558  -1.18727215   0.77801767   2.39161655   1.01270315
## [236]   0.30508064  -1.13987140   1.35085069   2.13213714   0.95034702
## [241]   0.48941676  -1.03804260   1.11768517  -0.25446052 -15.07630921
## [246]   1.12429826   0.28067653  -0.75125301  -1.91160477
```

```
#(c)
xVec[1:248]+2*xVec[2:249]-xVec[3:250]
```

```
##   [1] 1382   70 1221 1749  -98  796 1949  623 -134  618  288 1472  517  -45
##  [15]  794 1982 1489  344 -206 1207  292  771 2085  810 1032 1547  767  537
##  [29]  702  676  737  664 1451  435 1355  168 1150  989  926  348 1757 1299
##  [43]  409 -497  501 2150 1157 1081 1323 2030 1887 1744  879  590  493 1330
##  [57] 1254 1281  465  767 1691  464 1238  805 -519 1425  710 -611 1517  963
##  [71] 1836 2243 -158 1860  606  506 1917 1304 2021 2025  238  226  733 1538
##  [85]  581 -659  824 1109 1136 1339 1239 1584 2300  562  567 -375 1372  761
##  [99] 1142  714 1801 2220  624 -806 1738  268  398 1941  668 2037  829  345
## [113]  337  -45  635 -285 1225  691 1792 2216  123  538 1130 1124 1172  944
## [127]  271  -62  229  785  -70 1346 1622  381  104 1036 1015  199  589 1399
## [141]  601  506  560 -145  171 1204 1427 1278 1128  615  269   37 1521 2172
## [155] 1602  464   74 1575  599   88 -267 1185 1655 1564 1420  880  229 1651
## [169]  959 1306 2008 1243  267 1110  556 -791 1300  844 1578 2427  708 1554
## [183] 1439 1150 1269 2274 1419 1067  187 2071  781 -148 1767 1851 1019 -196
## [197]  554 2223 1710  -90  788 1209  876 1322  275 1191  323 1570 1234  768
## [211] 1715  903 -768 1546 1452  -47 1125 -330  871 2463  894  133  975  201
## [225] -137 1553  299  865  746  184  267  839  -63  863 2411  133 1739 1145
## [239] 1015   47  209 1468  846   10 1146   31 1405 1058
```

```
#(d)
sum(exp(-xVec[2:250])/(xVec[1:249]+10))
```

```
## [1] 0.01269872
```

```
#7.
#(a)
v <- yVec[yVec>600]

#(b)
index <- match(v,yVec)

#(c)
xvalue <-xVec[index]

#(d)
xmean <- mean(xVec)
xVec2 <- abs(xVec-xmean)^0.5

#(e)
sortedY <- sort(yVec,decreasing = TRUE)
maxY <- sortedY[1]
lowerVal <- maxY-200
```

```r
length(xVec[maxY>xVec & xVec>lowerVal])
```

```
## [1] 38
```

```r
#(f)
length(xVec[xVec%%2 == 0])
```

```
## [1] 124
```

```r
#(g)
sortedYincrease <- sort(yVec,decreasing = FALSE)
yindex2 <- match(sortedYincrease,yVec)
sort(xVec)[yindex2]
```

```
##   [1] 710  63 811 700 544 359 458 224 113 171 457  55 862 308 900 789 311
##  [18] 311 713 765 364  38 160 124 866 197 256 382 277 277 852 299 299 403
##  [35]  20 661 178 515 523 625 501 469 537 627 179  82  82  99 541 274 650
##  [52] 390 614  61 309 136 129 368 668  44  44 781  69  69 578 446 870 224
##  [69] 530 168 828 920 944 339 278 543 425   8 148 691 928 256 200 200 110
##  [86] 995  59 624 373  49 257 257 807 505  72 258  42 435 667 667 699 842
## [103] 193 193 193  18 353 113 358 828  34 399 701 280 275 275 461 702 222
## [120] 676 707 405 525  10 322 688 840 120 109 260 353  76 957 263 174 964
## [137]  48 683 517 517 880 497 865 977 408 206 206 206  14 603 603 365 365
## [154] 203 324 743 415 655 996  38 954 638 638 395 176 543 324 324 894  74
## [171] 127   1 652 836 107 987 444 444 358 480 363  48 511  93 956 324  24
## [188]  24 190 294 294 294 963 660 437 437 477  91  91 357 285 878 760 678
## [205] 585 148 724 339 860 631 986  84  42 533 669   5 618 621  29 238 238
## [222] 238 137 137 803 537 646 121 376 657 554  17  17 193 545 680 640  19
## [239]  19 863 189 188 632 452 807  74 123 216 371 269
```

```r
#(h)
indexY <- seq(1,250,3)
yVec[indexY]
```

```
##  [1] 709 517 437 783 671 860 581 347 279 974 216 776 538 460 985 248 317
## [18] 288 687 957 938 101 615 285 106 414 881 488 484 791 246 643 845 553
## [35] 465  87 993 116 473 635 310 428 965  19 489 803 604 800 175 516 902
## [52] 689 881 593 835 398 358 850 791 915 665 167 866 942 320 482 216 488
## [69] 681 273 884 970 469 717 127 952 284 695 325 777 792  72 738 791
```

```r
#8.
sum(cumprod(seq(2,38,2)/seq(3,39,2)))+1
```

```
## [1] 6.976346
```