STAT 280 : Introduction to Statistical Programming

Solution to Assignment 1

Section 2.1 Problem 3. 10 points

```
> 2000*((1.03)^(1:30)-1)
 [1]   60.0000  121.8000  185.4540  251.0176  318.5481  388.1046  459.7477
 [8]  533.5402  609.5464  687.8328  768.4677  851.5218  937.0674 1025.1794
[15] 1115.9348 1209.4129 1305.6953 1404.8661 1507.0121 1612.2225 1720.5891
[22] 1832.2068 1947.1730 2065.5882 2187.5559 2313.1825 2442.5780 2575.8554
[29] 2713.1310 2854.5249
```

Section 2.1 Problem 6. 10 points

First note that the area of a circle, with the radius r, can be calculated by $A = \pi r^2$:

```
> pi*(3:100)^2
 [1]    28.27433    50.26548    78.53982   113.09734   153.93804   201.06193
 [7]   254.46900   314.15927   380.13271   452.38934   530.92916   615.75216
[13]   706.85835   804.24772   907.92028  1017.87602  1134.11495  1256.63706
[19]  1385.44236  1520.53084  1661.90251  1809.55737  1963.49541  2123.71663
[25]  2290.22104  2463.00864  2642.07942  2827.43339  3019.07054  3216.99088
[31]  3421.19440  3631.68111  3848.45100  4071.50408  4300.84034  4536.45979
[37]  4778.36243  5026.54825  5281.01725  5541.76944  5808.80482  6082.12338
[43]  6361.72512  6647.61005  6939.77817  7238.22947  7542.96396  7853.98163
[49]  8171.28249  8494.86654  8824.73376  9160.88418  9503.31778  9852.03456
[55] 10207.03453 10568.31769 10935.88403 11309.73355 11689.86626 12076.28216
[61] 12468.98124 12867.96351 13273.22896 13684.77760 14102.60942 14526.72443
[67] 14957.12262 15393.80400 15836.76857 16286.01632 16741.54725 17203.36137
[73] 17671.45868 18145.83917 18626.50284 19113.44970 19606.67975 20106.19298
[79] 20611.98940 21124.06900 21642.43179 22167.07776 22698.00692 23235.21927
[85] 23778.71480 24328.49351 24884.55541 25446.90049 26015.52876 26590.44022
[91] 27171.63486 27759.11269 28352.87370 28952.91790 29559.24528 30171.85585
[97] 30790.74960 31415.92654
```

Section 2.3 Problem 1. 5+5 points

```
> r<- 1.08
> partial_sums<-c(sum(r^(0:10)), sum(r^(0:20)), sum(r^(0:30)), sum(r^(0:40)))
> ratios<-(1-r^(c(10, 20, 30, 40)+1))/(1-r)
> abs(partial_sums - ratios)    # Errors
[1] 0 0 0 0

> r<- 1.06
> partial_sums<-c(sum(r^(0:10)), sum(r^(0:20)), sum(r^(0:30)), sum(r^(0:40)))
> ratios<-(1-r^(c(10, 20, 30, 40)+1))/(1-r)
> abs(partial_sums - ratios)   # Errors
[1] 0 0 0 0
```

Section 2.3 Problem 2. 10 points

```
> r <- 1.08
> ratios <- (1 - r^((1:100)+1))/(1-r)
```

Section 2.3 Problem 7. 10 points

```
> sums<-c(sum(1/(1:500)), sum(1/(1:1000)), sum(1/(1:2000)), sum(1/(1:4000)),
  sum(1/(1:8000)))
> sums
[1] 6.792823 7.485471 8.178368 8.871390 9.564475

> logarithm<- c(log(500), log(1000), log(2000), log(4000), log(8000))+0.6
> logarithm
[1] 6.814608 7.507755 8.200902 8.894050 9.587197

> abs(sums - logarithm)      # Errors
[1] 0.02178467 0.02228442 0.02253436 0.02265934 0.02272184
```

Section 2.3 Problem 8. 10 points

```
>  rep(seq(0,4), each = 5)
 [1] 0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4
```

Section 2.3 Problem 9. 10 points

```
> rep(seq(1,5),5) + rep(seq(0,4), each = 5)
 [1] 1 2 3 4 5 2 3 4 5 6 3 4 5 6 7 4 5 6 7 8 5 6 7 8 9
```

Problem I 60 points

```
# (i)
seq(1, 12, by = 0.5)
# (ii)
(1:10)^3
# (iii)
v1 <- rep(c(1, -1), 50) / (1:100) # method a
v2 <- (-1)^(0:99) / (1:100) # method b
v1-v2
# (iv)
# method a
x <- numeric(49)
odd.numbers <- seq(1,49, by = 2)
x[odd.numbers] <- odd.numbers
x
# method b (elegant)
rep(c(1,0),length.out = 49)*seq(1,49)
# method c (replace)
replace(seq(1,49), seq(1,49) %% 2 == 0, 0)
# (v)
cumsum(1:20)
# (vi)
rep(1:10, times = 1:10)
```