1. (Due on a sheet of paper at 2:50pm) Let a > 0 and choose $s_1 > \sqrt{a}$. Define

$$s_{n+1} := \frac{1}{2}(s_n + \frac{a}{s_n})$$

for $n \in \mathbb{N}$.

- (a) Show that $\lim_{n \to \infty} s_n = \sqrt{a}$.
- (b) If $z_n = s_n \sqrt{a}$ then show that $z_{n+1} < \frac{z_n^2}{2\sqrt{a}}$.
- 2. (Due at 345pm in a Rnw, pdf file in dropbox subfolder week1)
 - (a) What is the following R-code attempting to do:

```
> function(a,n,tol){
+ while (abs(deltax) > tol){
+ deltax = (1/n)*(a /x^(n-1) -x)
+ x = x + deltax
+ }
+ return(x)
+ }
```

Explain the lines using comments in the Rnw file.

- (b) Can you write a R-code to compute the square root of a upto a tolerance of $\frac{1}{1000}$. Find the square root of $2, \pi, 10$ with this program and also using the sqrt command in R. Save your work in a file called
- 3. Can you formulate the recurssive sequence in question 1 appropriately to say $s_n^{(k)}$ and prove that it converges to the k-the root of a?

Problems due: 2,5

- 1. Problems in class Worksheet 10-1-2020.
- 2. Explain the following commands in R :

```
(a) > cbind(1:4, 5:8)
> rbind(1:4, 5:8)
> rbind(c(2,3),c(4,5))
> matrix(1,4,7)
> rep(1:4,2)
(b) > 1:10
> seq(10)
> seq(1,10,by=3)
> 10:1
> seq(from=10,to=1,by= -3)
> seq(1,10,length=7)
```

The explanations should be in the form of comments in the R code.

3. A matrix can be treated as a collection of row or column vectors. Given the row vectors u = (1, 2, 3) and v = (4, 5, 6) can you write a (single) statement to create the 2×3 matrix A having u as its first row and v as its second row vector?

4. Given the matrix $C = \begin{bmatrix} 11 & 5\\ 2 & 1\\ 18 & 7 \end{bmatrix}$, write the two statements to create $s = (11, 2, 18)^T$ and $t = (5, 1, 7)^T$, by extracting the columns of C.

(a) Use the

> diag

command to create D.

(b) Use the

> matrix

command to create T, M.