CSC 120 (R Section) — Quiz #2 with answers

No books, notes, or calculators are allowed. You have 30 minutes to write this quiz.

Question 1: [30 Marks] In the five blank areas below, write what R will output at that point if the commands shown are typed into the R console window. Note that the ">" shown at the beginnings of lines is the R command prompt, not something typed.

```
> M <- matrix (7, nrow=3, ncol=4)
> M[2,3] <- 10
> M[1,4] <- 20
> M
     [,1] [,2] [,3] [,4]
[1,]    7    7    7   20
[2,]    7    7   10    7
[3,]    7    7    7    7

> M[1,] + M[2,]
[1] 14 14 17 27

> L <- list (dog=1:4, cow=20, pig=37)
> L$cow + L$dog
[1] 21 22 23 24

> L[[3]] - L$cow
[1] 17

> set.seed(7)
> runif(1)
[1] 0.9889093
> runif(1)
[1] 0.3977455
> runif(1)
[1] 0.1156978
> sample(4)
[1] 1 4 2 3
> set.seed(7)
> v <- c (12, 10, 23)
> if (runif(1) < 0.5) v[1] <- runif(1) else v[2] <- runif(1)
> v[3] <- runif(1) + 3
> v
[1] 12.0000000  0.3977455  3.1156978
```

Question 2: [30 Marks] Consider a function called `mystery` defined as follows:

```
mystery <- function (A, what=0) {
    v <- numeric(nrow(A))
    for (i in 1:nrow(A)) {
        for (j in 1:ncol(A))
            if (A[i,j]==what) v[i] <- v[i] + 1
    }
    v
}
```

Below are two calls of this function. Write after them what R will output as a result of these calls.

```
> mystery (matrix (c (7, 0, 9, 4, 3, 8, 0, 0, 2, 0), nrow=5, ncol=2))
[1] 0 2 1 0 1

> mystery (matrix (1:9, nrow=3, ncol=3), what=9)
[1] 0 0 1
```

Question 4: [40 Marks] Write a definition for a function called `no_neg_rows` that takes one argument, called `mat`, which you should assume is a numeric matrix. The function should return as its value a numeric matrix with the same number of rows and columns as its argument, `mat`, and which has the same elements as `mat` except that if the sum of the elements in a row of `mat` is negative, then in the matrix returned, the negative elements in this row should be changed to zeros.

Here is an example call of this function:

```
> M <- matrix (c (0, 3, -2, 4, 1, -1, 5, 3, 3, -2, -7, -8), nrow=4, ncol=3)
> M
     [,1] [,2] [,3]
[1,]    0    1    3
[2,]    3   -1   -2
[3,]   -2    5   -7
[4,]    4    3   -8
> no_neg_rows(M)
     [,1] [,2] [,3]
[1,]    0    1    3
[2,]    3   -1   -2
[3,]    0    5    0
[4,]    4    3    0
```

One possible solution:

```
no_neg_rows <- function (mat)
{
    for (i in 1:nrow(mat)) {
        if (sum(mat[i,])<0) {
            for (j in 1:ncol(mat))
                if (mat[i,j]<0) mat[i,j] <- 0
        }
    }
    mat
}
```

Another possible solution:

```
no_neg_rows <- function (mat)
{
    for (i in 1:nrow(mat)) {
        s <- 0
        for (j in 1:ncol(mat))
            s <- s + mat[i,j]
        if (s<0) {
            for (j in 1:ncol(mat))
                if (mat[i,j]<0) mat[i,j] <- 0
        }
    }
    mat
}
```