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.

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

[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:

```r
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.

```r
> 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:

```r
> 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:

```r
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:

```r
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
}
```