CSC 120 (R Section) — Quiz #1 with answers

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

Question 1: [24 Marks] On the six blank lines 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.

```
> 7+3*10
[1] 37
> a <- 5
> b <- a+1
> a <- 2
> a*b
[1] 12
> x <- c(4,3,9)
> x[1]+x[a]
[1] 7
> x*a
[1]  8  6 18
> y <- x
> x[2] <- 10
> x+y
[1]  8 13 18
> s <- "pineapple"
> substring(s,4,4)=="e"
[1] TRUE
```

Question 2: [26 Marks] Consider a function called `mystery` defined as follows:

```
mystery <- function (a) {
    x <- a
    if (a[4]==0)
        x[1] <- 0
    else
        x[1] <- 1
    x[2] <- a[1] + a[2]
    x[3] <- x[1] + x[2]
    x[1] + 10*x[2] + 100*x[3]
}
```

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

```
> mystery (c(3,2,7,0,2))
[1] 550
> mystery (c(7,3,1,4))
[1] 1201
```

Question 3: [25 Marks] Write down a definition for a function called `limit` that takes as arguments a number `x` and a positive number `lim`, and returns as its value the argument `x` if its absolute value is less than `lim`, and otherwise returns `lim` if `x` is positive and `-lim` if `x` is negative. You must use only R features that have been covered in lectures and labs; in particular, you must not use R's `min` or `max` functions. You may use the `abs` function if you wish.

Examples: `limit(-3,7)` is `-3`, `limit(-9,7)` is `-7`, `limit(12,7)` is `7`.

Two possible solutions:

```
limit <- function (x,lim) {
    if (x < -lim) -lim
    else if (x > lim) lim
    else x
}

limit2 <- function (x,lim) {
    if (abs(x) < lim) x
    else if (x > 0) lim
    else -lim
}
```

Question 4: [25 Marks] Write down a definition for a function called `positive_sum` that takes two arguments, called `vec1` and `vec2`, which you should assume are numeric vectors of the same length (which is at least one). The function should return as its value a numeric vector the same length as its arguments, in which each element is the sum of the corresponding elements of `vec1` and `vec2`, except that if this sum is negative, the value for that element should be `-1`. You should use only those R features that we have covered so far in the course.

Here is the output from an example call of this function:

```
> positive_sum (c(3,-18,2,-2,5), c(2,13,4,-3,-2))
[1]  5 -1  6 -1  3
```

Two possible solutions:

```
positive_sum <- function (vec1, vec2) {
    result <- numeric(length(vec1))
    for (i in 1:length(vec1)) {
        result[i] <- vec1[i] + vec2[i]
        if (result[i] < 0) result[i] <- -1
    }
    result
}

positive_sum2 <- function (vec1, vec2) {
    result <- vec1 + vec2
    for (i in 1:length(result)) {
        if (result[i] < 0) result[i] <- -1
    }
    result
}
```