



# Northeastern University

## College of Science

### Module 1 Homework

**Problem 1 (40 points)** Choose the answers in the following questions:

(a) What is the class of the object defined by `vec <- c(5, TRUE)` ?

- Numeric
- Integer
- Matrix
- Logical

(b) Suppose I have vectors `x <- 1:4` and `y <- 1:2`. What is the result of the expression `x + y`?

- A numeric vector with the values 1, 2, 5, 7
- A numeric vector with the values 2, 4, 2, 4
- An integer vector with the values 2, 4, 4, 6
- An error

(c) Suppose I define the following function in R:

```
fsin <- function(x) sin(pi*x)
```

What will be returned by `fsin(1)` ?

- The number 0 is returned
- The number 1 is returned
- A warning is given with no value returned
- An error is returned because 'pi' is not specified in the call to 'fsin'

(d) What is returned by the R command `c(1,2) %*% t(c(1,2))` ?

- The number 5
- A one by two matrix
- A two by two matrix
- An error is returned because the dimensions mismatch



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(e) Suppose I define the following function in R:

Consider the following function:

```
f <- function(x) {  
  g <- function(y) {  
    y + z  
  }  
  z <- 4  
  x + g(x)  
}
```

If I then run in R the following statements

```
z <- 15  
f(3)
```

What value is returned?

- 16
- 7
- 10
- 4



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### Problem 2 (20 points)

Use R to calculate  $\sum_{x=1}^{1000} x^2 = 1^2 + 2^2 + \dots + 1000^2$ .

Please hand in your R commands and the results you produce by running those commands.



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### Question 3 (40 points)

Write an R script that does all of the following:

- a) Create a vector  $X$  of length 20, with the  $k^{\text{th}}$  element in  $X = 2k$ , for  $k=1 \dots 20$ . Print out the values of  $X$ .
- b) Create a vector  $Y$  of length 20, with all elements in  $Y$  equal to 0. Print out the values of  $Y$ .
- c) Using a “for” loop, reassigns the value of the  $k$ -th element in  $Y$ , for  $k = 1 \dots 20$ . When  $k < 12$ , the  $k^{\text{th}}$  element of  $Y$  is reassigned as the cosine of  $(3k)$ . When the  $k \geq 12$ , the  $k^{\text{th}}$  element of  $Y$  is reassigned as the value of integral  $\int_0^k \sqrt{t} dt$ .

Please run the script and hand in your R execution results. The R script file should be submitted separately as part of the “hw1.r” file.