(i)	Write your name on this document and hand in.
(ii)	BE SURE THAT THE FIRST LINE OF YOUR R SCRIPT CONTAINS YOUR NAME (**in case your script does not have your name : you'll lose 1 point**)
(iii)	Upload the R script file (with extension .R) on Toledo > Assignment > upload R part.

Part 1: R part (10 points)

1. **(4.5 points)**

   We want to write a function to compute an approximation to a sine function. The final goal is to write a function that computes the value of sin(x) at a given x using *n* terms of the series expansion of the sine function:

   $$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots = \sum_{k=1}^{n}(-1)^{(k-1)}\frac{x^{2k-1}}{(2k-1)!}$$

   Follow the steps given below:

   a. (points : 0.5)Take x = π/6 where π is a given constant in R (use pi). This x value is the first value of a vector **series_sin**.

   b. (points: 0.5)Compute now the 2nd and 3rd value of this vector **series_sin** as given below. (Hint: the function *factorial* to compute n!).

   (2nd value) : x - $\frac{x^3}{3!}$

   (3rd value) : x - $\frac{x^3}{3!}$ + $\frac{x^5}{5!}$

   ```
   > series_sin
   [1] 0.5235988 0.4996742 0.5000021
   ```

   c. (points: 3)Write a function **fun_sin** which is a function of 2 arguments *n* and *x*, where *n* is het number of terms taken in the series expansion. This function has default values n=5 and x=π/2.
   The return values of this function are *n, x* and the *nth value of series_sin*.

   d. (points: 0.5)Apply this function to x= π/6 and n= 3 and to x=π/4 and n = 6.

   ```
   > fun_sin_an(x=pi/4,6)
   $n
   [1] 6

   $x
   [1] 0.7853982

   $th_nth_approximation_of_sin_in_x_is
   [1] 0.7071068
   ```

2. Use the Business data (Business.xlsx) (5.5 points)

subid	business_status	sex	beckdep	regard	selfcon	neoextra
1	3	2	5	65	4.47	60.03
2	2	1	7	59	3.61	32.53
3	3	2	1	65	4.75	54.88
4	3	2	2	59	4.47	65.19
5	3	1	3	65	3.67	61.59

subid	Subject identifier	
Business_status	Financial status	1: bankruptcy 2: steady state 3: rapid expansion
sex		1: Female, 2: male

Employees of a variety of companies were assessed on a range of personality measures.
Employees were assessed on depression (**beckdep**), self-regard (**regard**), self-control (**selfcon**), extraversion (**neoextra**), openness to experience (**neoopen**), agreeableness (**neoagree**), conscientiousness (**neoconsc**), and negative affect (**negafect**).
(make use of dplyr package for answering b and c).

a. (points: 0.5) count the number of missing values in business_status. Do the same for sex.
b. (points: 0.5)There are a few records with a business status of 4. This is not possible. Hence, replace these values with a NA. Give the new data table the name **sub**1.
c. (points: 0.5)Create from **sub1** a data table **sub2** with only those observations with values for conscientiousness (**neoconsc**) strictly larger than 30.
d. (points: 0.75)Use *ggplot*2 and **sub2** to create a scatterplot of *openness to experience* (**neoopen** – X axis) versus *conscientiousness* (**neoconsc** – Y axis). Be sure to give the dots a different color depending on the values of *business status*.
e. (points: 1.25)Make now use of the **pipe operator** to perform steps *b, c and d* in **one step**.
f. (points: 1)Adapt the syntax of point d. to remove the missing values for Business_status. Therefore use the function *remove_missing* (from the package ggplot2). Give this new plot the name **plot1**.
g. (points: 1)Use now **plot 1** and make use of the function *ggMarginal* (package ggExtra) to obtain the plot below: