Assignment 1 – Due February 8, 2023

1) Find the full iris data set called *iris.csv* on Brightspace.

   (a) Read the data into an R variable called *dat* and label all missing data (-99) as R's *NA*.

   (b) Compute the sample means and variances of the widths and lengths of both petals and sepals. Use variable names *mdat* for the means and *vdat* for the variances.

   (c) Add a new column called "Bsepal" to *dat* which is an indicator for sepal width ≥ 3.1 (1 if larger 0 otherwise).

   (d) Add a new versicolor iris with sepal length, sepal width, petal length and petal width of 6.1, 3.2, 4.1, 1.3 respectively.

   (e) Break the data for the three types of irises (setosa, versicolor, virginica) into variables named *datse*, *datve* and *datvi* respectively.

   (f) Repeat (b) for the three types of irises. Use a similar naming convention so add an *m* for the sample means and *v* for the sample variances.

   Submit your R code as *q1.R*. Also, please label each part (a)-(f) with a comment header (i.e. # (a)). On any line R ignores anything after #.

2) Write R code that will compute the root of the following function

$$f(x) = \frac{1}{1 + \mathrm{e}^{-(x-1)}} - \frac{1}{2}.$$

   Submit your R code as *q2.R*.

3) The probability density function for a normal distribution ("bell curve") with mean μ and variance σ^2 is given by

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} \mathrm{e}^{-\frac{(x-\mu)^2}{2\sigma^2}}, \quad x \in \mathbb{R}, \mu \in \mathbb{R}, \sigma^2 > 0.$$

   (a) Write an R function called *mdnorm1* that computes $f(x)$ for any value of x, μ and σ.

   (b) Copy the function in (a) and call it *mdnorm2*. Set the defaults for μ and σ to be 0 and 1 respectively.

   (c) Copy the function in (b) and call it *mdnorm3*. Add a new input called *log* that defaults to *FALSE*. If *FALSE* return $f(x)$ otherwise return $\ln f(x)$. Make sure you first simplify the expression returned when *TRUE*.

   Submit your R code as *q3.R*. Also, please label each part (a)-(c) with a comment like you did for question 1).