

**SCHOOL OF ADVANCED TECHNOLOGY**

ICT - Applications & Programming

Computer Engineering Technology – Computing Science

**Numerical Computing – CST8233**

# Lab #3 – Functions, Statistics and Z-Scores

The main objective of this lab is to learn: 1) how to work with polynomial functions, and 2) how to develop statistics formulas using R language. Also, you will use z-scores to find the probability of certain events.

## Objectives

* Read and follow the instructions, and
* Complete all steps.

**You will need to show your completed work to your lab professor to get your grades.**

## Grades:

**2%** of your final course mark

## Deadline

During the lab period of Week 6

## PART I

### Step 1. Working with Functions

In this step, you will use PolynomF package.

1. Install this package using install() function or just use the install option in the lower right panel of RStudio, i.e., the utilities panel [Packages -> Install option]
2. Load this package using require() function.

You are given the following function:

Define the independent variable as an object of class polynom using polynom() function. Then, assign the value of the given function to a dependent variable called p.

* What is the class of the variable p.? *Show how you find this to the lab professor*.

To find the coefficients of this function, you can use coef() function.

* Find these coefficients and *show them to the lab professor*.

PolynomF can calculate with only one polynomial variable at a time. Define another independent variable and called it y. You are given another function called q as follows:

* Check the classes of both q and y.
* Find the result of p + q, p – q, and p \* q.

*Show your results to the lab professor.*

In addition, PolynomF can calculate the derivative of polynomial function using deriv() function.

* Find the derivative of both p and q. Call these derivatives as dpdx and dqdy, respectively. *Show them to the lab professor.*
* Plot the functions p and dpdx on the same figure using curve() function for values of . Add a title of “p(x), dpdx” to the y axis. Use Add argument in the second curve function so that dpdx is added to the same plot.
* Add a horizontal line with a slope of zero and intercept of zero. Use abline() function.

*Show your final graph to the lab professor.*

### Step 2. Statistics in R

We will work on a built-in dataset called “airquality”. To upload this dataset, we need to make sure that the package datasets is selected under packages tab. You can find this package under *System Library*. Also, make sure that you have dplyr package installed and loaded.

* Load “airquality” dataset and assign it to a variable named my\_df
* Display the structure of my\_df using str() function and print the first six lines from my\_df.
* Find the name of each column of my\_df using names() function
* Create a new dataframe that shows only the temperature column and name it as my\_df\_temp. You can use select() function
* Find the mean, median, and standard deviation of the daily temperature in June, July, and August

Assume that the temperatures in the months from May to September are normally distributed, i.e., follow the normal distribution. Find the following probabilities using pnorm() function:

* The probability that the temperature during these months is less than 70.
* The probability that the temperature during these months is greater than 85
* The probability that the temperature during these months is less than 90 and greater than 75

Confirm your answers manually using the z-tables shown in the class.

*Show your answers to the lab professor*

(p <- PolynomF::polynom(c(7, 2, 3, 1)))

# 7 + 2\*x + 3\*x^2 + x^3

class(p)

# [1] "polynom"

>coef(p)

[1] 7 2 3 1

> class(x)

[1] "character"

>y <- c(“”)

> (p <- polynomial(c(0,2,2)))

2\*x + 2\*x^2

>

> gsub("x", "y", p)

[1] "2\*y + 2\*y^2"

> print(p, variable = "y")

2\*y + 2\*y^2