ASSIGNMENT 13 - NUMERICAL INTEGRATION AND DIFFERENTIATION

IS 605 FUNDAMENTALS OF COMPUTATIONAL MATHEMATICS - 2014

- Write a program to compute the derivative of $f(x) = x^3 + 2x^2$ at any value of x. Your function should take in a value of x and return back an approximation to the derivative of $f(x)$ evaluated at that value. You should not use the analytical form of the derivative to compute it. Instead, you should compute this approximation using limits.
- Now, write a program to compute the area under the curve for the function $3x^2 + 4x$ in the range $x = [1, 3]$. You should first split the range into many small intervals using some really small Δx value (say 1e-6) and then compute the approximation to the area under the curve.

Please solve these problems analytically (i.e. by working out the math) and submit your answers.

- Use integration by parts to solve for $\int sin(x)cos(x)dx$
- Use integration by parts to solve for $\int x^2 e^x dx$
- What is $\frac{d}{dx}(x \cos(x))$?
- What is $\frac{d}{dx}(e^{x^4})$?

Please package all your work in an R-Markdown document and submit it with your first and last name as the file name.