Assignment 3

Numerical Computing
B. Math. Year 1,
January - May 2022.

Due on: March 13^{th}, 2022.

Please give arguments where necessary. If it is unclear from your answer why a particular step is being taken, full credit will not be awarded. Please feel free to discuss amongst yourselves; however, copying the assignment solutions from someone else is strictly prohibited and both persons involved will be penalized. Each one of you must submit your own answers. Total: **60 points**.

1. (a) Problem 1,(a) and (b), page 134, **SB** [5 + 5 points].
   (b) Problem 2, (a) and (b), page 134, **SB** [8 + 2 points].
   (c) Problem 3, page 134, **SB** [5 + 3 + 1 + 1 points].
   (d) Problem 8, page 135 - 136, **SB** [10 points].
2. (a) Evauluate the function $f(x) = \sin(2\pi x)$ at 21 equispaced nodes in the closed interval $[-1, +1]$. Compare the Lagrange interpolating polynomial against the cubic spline interpolation of the same function. The best way to do this is by plotting all three functions (the exact one, the Lagrange interpolant and the cubic spline interpolant) on the same plot. [10]
   (b) Repeat the same as above with a set of support point pairs: $f(x_i) = \sin(2\pi x_i) + (-1)^{(i+1)} \times 10^{-4}$ (x_i are the same points you used in the previous part), $x_0 = -1$. Which of the two interpolating methods are more sensitive to a small perturbation of the original function? Discuss. [10]