

## Numerical Analysis: MATH 237 and 337

### Qualifying Examination

Spring 2016

For passing this exam, four problems must be done completely correctly and one problem must be at least 75% correct. Of the four completed problems, two must come from each part of the exam. (E.g., completing problems 1, 2, 3, 4 and doing problem 5 at 75% will be a passing score; on the other hand, completing 1, 2, 4, 6 and doing either 3 or 5 at 75% will constitute a pass.)

You have three hours to complete the exam.

Note : Make sure to provide explanations to all steps of your solutions and to explain all answers to posed questions.

#### Part 1

1. Consider  $f(x) = \ln(x + 3)$ .

(a) Use  $x_0 = 0$ ,  $x_1 = 0.2$  and  $x_2 = 0.5$  to construct the Lagrange interpolating polynomial of degree at most two to approximate  $f(0.25)$  and find the absolute error of this approximation.

## Part 2

### 4. Method

$$Y_{n+1} = \frac{1}{3}(2Y_n + Y_{n-1}) +$$