**CSCI 2150L**

**Session 16 Topics:**

**12/3/2014**

**Fall 2014**

1. In this session we discussed simpson’s 1/3rd rule, another method for approximating integral of a function within a given lower and a upper bound. The problem of finding an integral can be visualized as finding the area under the curve *f(x)* between lower and upper bound a and b. For simpson’s rule the entire area under the curve for a given interval is sub-divided into sections where each section covers three consecutive points from the interval. One such interval covering points is shown below.

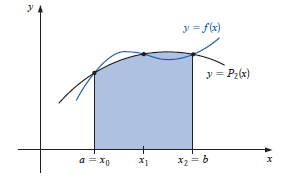


Fig. 1: Area under a curve divided into sections having three points of a given interval. [Courtesy: Numerical Analysis by Burden and Faires; 9th edition]

Using Lagrange form we can approximate the functional form of the section shown in the figure as a polynomial of degree 2 above from the three points as follows.

It is to be noticed that since the points are equally spaced from each other (similar to trapezoid rule interval spacing from the previous handout) the formula above can be simplified using relations  where *h* is the spacing between consecutive points. If we denote by the area covered by between interval and then it will be a close approximation of. The expression of is given as follows.

The computation of is straightforward and follows from the equal spacing *h* between consecutive points. Now if we find all such areas for the entire range and add them together we would find area under the curve for the entire range i.e. the integral. All such areas are listed as follows.

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Adding all such areas will give us an approximate formula for the integral using simpson’s 1/3rd rule as follows.

Notice the repetition on same coefficients for the even and odd terms within the bracket except the terminal terms. We created a function in lab that computes this expression given a function and the lower and upper bound.