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Math128A: Numerical Analysis

Programming Assignment #2, Due 4/24/2012

Develop an adaptive quadrature by combining (composite) Simpson's rule and Romberg integration as follows:

- On each interval $[a, b]$, let $h = (b - a)/4$ and get the values of given function at 5 points $x_j = a + j * h$, with $j = 0, 1, 2, 3, 4$.
- Compute Simpson's rule to get Q_1, and composite Simpson's rule to get Q_2.
- Work out the correct Romberg integration rule for Simpson's rule; apply it Q_1 and Q_2 to get a new estimate Q.
- When $|Q - Q_2|$ is less than given tolerance, accept Q as true integral value; otherwise subdivide $[a, b]$ into two intervals of equall length and recursively apply the same adaptive quadrature to them.

You can base your code on the matlab code AdaptSimpson.m on the class website. Make sure you do not ever calculate the given function more than once at any given point.

You should turn in a .m file quadxxx.m which contains a matlab function of the form

```
function [Int,fcnt,info] = quadxxx(fun,a,b,tol)
```

where xxx is your student id. On output, `Int` is the numerical integral, `fcnt` is the number of function evaluations, and `info` is your output message. On input, `fun` is the function handle, `a` and `b` are the two end points of the integral, and `tol` is the tolerance.

Your progam will be graded on the accuracy and number of function evaluations as compared against the `quad` function in matlab.

Email your .m file to your GSI by 11:59PM, April 24, 2012.