

## Computing Error Estimates for Approximating Sums

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For each of the following functions (on the given integral) compute how many subintervals are needed to guarantee an error of no more than 0.05 for

1. Left and right Riemann sums
2. Midpoint Riemann sum
3. Trapezoidal rule

You may use Maple to get graphs of the relevant derivatives in order to get the bounds you need. For the first two, compute the exact integral and verify that the error estimates you calculated do, indeed, hold.

1.  $f(x) = x^4 + \sin(x)$  on  $[0, 1]$
2.  $f(x) = \sin(x)$  on  $[0, \pi]$
3.  $f(x) = e^{x^2}$  on  $[0, \frac{1}{4}]$
4.  $f(x) = \frac{x}{1+x^2}$  on  $[-1, 4]$ .