# MATH 2300 – review problems for Exam 1, addendum

Here's one more review problem:

Recalling that the error bound for the Trapezoidal rule in approximating a definite integral is given by $|E_T| \leq \frac{K(b-a)^3}{12n^2}$, how large should $n$ be to guarantee that a trapezoidal rule approximation of $\int_1^4 \frac{6x^{5/2}}{5}\,dx$ is accurate to at least within .01?

Recall $k$ is a number such that

$$|f''(x)| \leq k \quad \text{on } [1,4]$$

$$f(x) = \frac{6}{5}x^{5/2}$$

$$f'(x) = 3x^{\frac{3}{2}}$$

$$f''(x) = \frac{9}{2}x^{\frac{1}{2}}$$

$|f''(x)| = \frac{9}{2}\sqrt{x}$. $\frac{9}{2}\sqrt{x}$ is increasing on $[1,4]$

So the max occurs at $x=4$.

$|f''(x)| \leq \frac{9}{2}\sqrt{4} = 9$ on $[1,4]$. $k=9$.

$$|E_T| \leq \frac{9(4-1)^3}{12n^2} = \frac{3\cdot 3^4}{4n^2} = \frac{81}{4n^2}$$

It suffices to get $\frac{81}{4n^2} \leq .01 = \frac{1}{100}$

solving:

$$\frac{81\cdot 100}{4} \leq n^2$$

$$n \geq \sqrt{\frac{81\cdot 100}{4}} = 45.$$