Let $I = \int_0^1 e^{-x^2}\, dx$.

Use Theorem 1 to answer the following.

1. How closely will L_{5000} approximate I? R_{5000}? T_{5000}?

   Do your results reflect actual error or error bounds?

2. Find a value of n so that L_n approximates I within 0.00001 of the actual value.

3. Repeat #2 but with T_n.

Recap for Today

- Even if we can't find an antiderivative, we can approximate an integral. BUT ... we need to have an idea how close the approximation is to the actual value of the integral.
- If $f(x)$ is monotone on $[a, b]$, we can easily determine bounds on how close L_n, R_n and T_n are to $\int_a^b f(x)\, dx$ when we don't know the exact value of the interval.
- When $f(x)$ is *not* monotone on $[a, b]$, we can still determine error bounds for L_n and R_n, but not quite as easily.