1. Let $I = \int_0^{\pi} \sin(x^2)\ dx$.

   (a) Use Maple to look at a graph of $f(x) = \sin(x^2)$. Is $f$ monotone over the interval $[0, \pi]$?

   (b) How closely will $L_{500}$ approximate $I$? $R_{500}$? Do your results give you the exact error from using the left and right sums, or error bounds?

   (c) Use $L_n$ to approximate $I$ within 0.01 of its actual value.

2. Let $I = \int_{-1}^{2} -2\ln(1 + x^2)\ dx$.

   (a) Is $f(x) = -2\ln(1 + x^2)$ monotone over the interval $[-1, 2]$.

   (b) How closely will $R_{500}$ approximate $I$?

   (c) Use $R_n$ to approximate $I$ within 0.01 of its actual value.

## Recap for 7.2

- The error introduced by $L_n$ and $R_n$ when approximating $\int_a^b f(x)\, dx$ is related to the magnitude of $f'(x)$ on $[a, b]$.
- If $f$ is monotone on $[a, b]$, it's usually easiest to use Theorem 1 for the error bounds.
- If $f$ is not monotone, then we can use Theorem 2.