EXERCISES, week 3.

1. Explain how to avoid loss of significance errors when evaluating $\sqrt{1+x} - 1$ (for $x$ near 0) and $\ln(x + 1) - \ln x$ (for $x$ large).

2. Perform the error analysis (as in the A&H notes on error propagation) for solving $x^2 - 40x + 1 = 0$ by means of the quadratic formula.

3. Explain how to avoid loss of significance errors when evaluating $e^x - 1$ for $x$ near 0.

4. Find the bounds for the error and relative error in approximating $\sin(\sqrt{2})$ by $\sin(1.414)$.

5. Show that $\text{Rel}(\tilde{x}/\tilde{y}) = \text{Rel}(\tilde{x}) - \text{Rel}(\tilde{y})$. Explain why $\text{Rel}(\tilde{x}/\tilde{y}) \approx \text{Rel}(\tilde{x}) - \text{Rel}(\tilde{y})$ for $\text{Rel}(\tilde{y})$ small.

6. Let the arguments below be correctly rounded to the number of digits shown. Bound the error and the relative error of $f(\tilde{x})$ for a) $\cos(1.473)$, b) $\arctan(2.62)$, c) $\ln(1.4712)$. 