

HOMEWORK 3. NUMERICAL METHODS

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- (1) Use four-digit rounding arithmetic and the quadratic formulas to find the most accurate approximations to the roots of the following quadratic equations. Also use the form of the quadratic formula by rationalizing the numerator. Compute the absolute errors and relative errors.

$$\begin{aligned}\frac{1}{3}x^2 - \frac{123}{4}x + \frac{1}{6} &= 0 \\ \frac{1}{3}x^2 + \frac{123}{4}x - \frac{1}{6} &= 0\end{aligned}$$

- (2) Let

$$f(x) = \frac{x \cos x \sin x}{x - \sin x}$$

- (a) Find $\lim_{x \rightarrow 0} f(x)$.
 - (b) Use four-digit rounding arithmetic to evaluate $f(0.1)$.
 - (c) Replace each trigonometric function with its third Maclaurin polynomial and repeat part (b).
 - (d) The actual value is $f(0.1) = -1.99899998$. Find the relative error for the values obtained in parts (b) and (c).
- (3) Find the number of terms of the exponential series such that their sum gives the value of e^x correct to six decimal places at $x = 1$.