

Name: _____

1. Consider the following linear system:

$$\begin{aligned}x - \frac{800}{801}y &= 10 \\ -x + y &= 50\end{aligned}$$

Assume that $800/801 \approx 0.998751560549313$

- (a) Verify that the exact solution is $\mathbf{x}^* = [48010, 48060]^T$.

- (b) Obtain the solution by a direct inversion of the coefficient matrix and assuming that we are using a computer with four significant digits, compare it with the exact solution \mathbf{x}^* .

- (c) Compare the solution to one obtained on a computer with three digits of significance. Remark on how large the error is for both these cases.

2. Solve the following linear system:

$$\begin{aligned}x + y &= 2 \\x + 1.0001y &= 2 + \alpha.\end{aligned}$$

Here the number α assumes the following three values: 0, 10^{-3} and 10^{-4} . Can you explain the significant difference in the solutions ?

Solution:

$$\alpha = 0; \quad x = 2; \quad y = 0.$$

$$\alpha = 10^{-3}; \quad x = 0.99999999996362; \quad y = 1.00000000003638,$$

$$\alpha = 10^{-4}; \quad x = 1.89999999997817; \quad y = 0.10000000002183.$$