Homework 2
CS 323 - Numerical Analysis

1. Given the polynomial $P(x) = x^4 + 5x^3 - 9x^2 - 85x - 136$
   (a) Use Newton's method with Horner to find a root with $\epsilon = 10^{-5}$, starting from $x_0 = -4$
   (b) If x_r is the solution found before, find the polynomial $P_1(x)$ obtained by dividing the original polynomial by $x - x_r$.
   (c) Again use Newton's method with Horner to find a root of $P_1(x)$.
   (d) Verify that the root found is also a root of $P(x)$.
2. Use Newton's Method to find a solution of the equation $e^{6x} + 3(\ln 2)^2 e^{2x} - e^{4x} \ln 8 - (\ln 2)^3 = 0$ with error tolerance 10^{-5}, and that is in the interval $-1 \leq x \leq 0$.
3. Repeat the previous exercise using the Secant Method.
4. For each one of the following systems of linear equations:

   I)

$$\begin{aligned} 20 &= 8x_1 + 3x_2 \\ 30 &= 12x_2 + 6x_3 \\ 10 &= x_1 + 10x_3 \end{aligned}$$

   II)

$$\begin{aligned} 2x_1 + x_2 + 5x_3 &= 1 \\ 2x_1 + 2x_2 + 2x_3 &= 1 \\ 4x_1 + x_2 &= 2 \end{aligned}$$

   III)

$$\begin{aligned} x_1 + x_2 - x_3 &= -3 \\ 6x_1 + 2x_2 + 2x_3 &= 2 \\ -3x_1 + 4x_2 + x_3 &= 1 \end{aligned}$$

   (a) Use Gaussian Elimination (2.0) with backward substitution to find the solution. Show the resulting matrices after each one of the matrix row operations.
   (b) Use Cramer's Rule to solve them. Compute the determinants using minors.