Homework 2

For plain vanilla calls and puts, implement the following option pricing methods:

- **Basic requirement (80 points):**
  \[
  \begin{align*}
    &\text{Black-Scholes formulas (for European options)} \\
    &\text{Monte Carlo simulation (for European options)} \\
    &\text{CRR binomial tree model (for both European and American options)}
  \end{align*}
  \]
  (Inputs: \( S_0, K, r, q, \sigma, T \), number of simulations, number of repetitions, \( n \). Outputs: Option values for all methods and 95% confidence interval for Monte Carlo simulation.)

- **Bonus 1 (5 points):**
  Implement the CRR binomial tree with one column vector.

- **Bonus 2 (5 points):**
  Implement the combinatorial method to price European options.