Homework 2

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

- Basic requirement (80 points):
  
  \[
  \begin{align*}
  &\text{Black-Scholes formula (for European options)} \\
  &\text{Monte Carlo simulation (for European options)} \\
  &\text{CRR binomial tree model (for both European and American options)}
  \end{align*}
  \]

  (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.