Exercise 2

1. A stock price is currently $S_0 = 40$. At the end of the month, it will be either $S_1^u = 42$ or $S_1^d = 38$. The risk-free rate of continuously compounded interest is 8% *per annum.* What is the value $c_{1|0}$ of a one-month European call option with a strike price of \$39?

2. A stock price is currently 50. At the end of six months, it will be either 45 or 55. The risk free-rate of interest continuously compounded is 10% per annum. What is the value of a six-month European put option with a strike price of 50?

3. Let the annual rate of interest be r and let the price of a share at the present time of $t = 0$ be $S_0 = 100$. Suppose that, after one year, when $t = 1$, the price will be either $S_1^u = 200$ or $S_1^d = 50$. A call option to buy the share at time $t = 1$ at a price of $K_{1|0} = 150$ can be purchased at time $t = 0$ for $c_{1|0}$.

Show that, unless $c_{1|0} = \{100 - 50(1 + r^{-1})\}/3$, there will always exist a combination of x shares and y options that will yield a profit. (Here, x is negative, if you are selling shares at time $t = 0$, and postive, if your are purchasing them, and likewise for the number of options purchased or sold.)