Math 194 - Homework 1
(Due Tuesday Jan 16, 5:00pm)

Reading: Chapter 1 of the book, handout from Hall, and lecture notes 1-3.
Show FULL JUSTIFICATION for all your answers.

1. Suppose a company wants to purchase 10 ounces gold, to be delivered in June 2018. Check Chicago Mercantile Exchange webpage to get a quote for the delivery price of this contract (go to http://www.cmegroup.com, click on “Trade” on the top bar, and choose Gold, then look up the number in the column ‘Last’ for the corresponding date to get the price in USD per ounce). Suppose the spot price is $1321 per ounce.

(a) What is the payoff if the price goes up by 20% by maturity date of the contract?
(b) What is the payoff if the price goes down by 20% by maturity date of the contract?
(c) Suppose the price goes up by 20% with probability 0.60, and goes down by 20% with probability 0.40. What is the company’s expected payoff?

2. Use Yahoo Finance Webpage to check the price of one share of Netflix stock today, as well as the price of a Netflix call option expiring in January 2019 and strike price of $220. Suppose an investor purchases a European call option for 100 shares of stock. Assume that at expiration there are two possible scenarios for the stock price: it has gone up or down by 15% since purchase of the option (current price). Find the payoff in each case. Make sure to indicate all of the information on which your calculation is based: the date and time on which you looked up prices, the price for the stock itself (use the last closing price if the market is not open when you look up prices), the ask price for which you can buy the option, etc.

3. In Problem 2, suppose you use your money (i.e. 100× the price of each option purchased in Problem 2) to purchase actual stocks instead of the options. Compute your payoff in similar situations, that is, the stock price going up or down by 15% compared to the price today. Compare your results with those of Problem 2.

4. Suppose the stock of a company worth $50 a share today. Suppose you purchase 100 European put options with expiration date of July 12, 2018 and strike price of $45, for $3 an option.

(a) What is you payoff if the stock price rises by 10% by the expiration date?
(b) What is you payoff if the stock price drops by 10% by the expiration date?
(c) Plot the graph of your payoff versus the stock price on July 12, 2018.

5. A combination option called a straddle is obtained by buying a (European) call and a (European) put option with the same expiration date and the same strike price, all based on the same underlying asset. The investor who buys the straddle is betting that there will be a large movement in the price of the underlying asset, but is uncertain whether it will involve an increase or a decrease in the price. Suppose the initial price of the call option with strike price of $K$ is $P_1$, and the initial price of the put option is $P_2$. Write a formula for the payoff of the straddle and draw its graph as a function of the final price $S(T)$ of the underlying asset. (Make sure to label your axes on the graph.)

6. Suppose at a given time, a stock is traded on NY Stock Exchange for the price of $120, and on London Stock Exchange for £100, while the exchange rate is $1.17 per £1. Give an example of an arbitrage opportunity in this market, and show that it indeed provides risk-free profit.