Math 181 HW4

1. A stock price is currently \$100. Over a six month period, its price is expected to up or down by %10. The risk free interest rate is %8 per year with continuous compounding. What is the value of a one-year European call option and a European put option with a strike price of \$100?

2. Consider a binomial random walk (i.e. Cox-Ingersoll-Ross) model of an equity, with up and down factors u and d respectively, with risk-free rate r and with time step dt. Compare the "real" and the "risk-neutral" models, with probability p' and p for an up step, respectively. Define the average growth rate μ by the equation

$$E[S(dt)] = e^{\mu dt} E[S(0)] \tag{1}$$

A real model is risk-averse if $\mu > r$.

(i) Show that a a real model is risk averse if and only if $p' > p$.

(ii) Show that the $E[S(ndt)] = e^{\mu ndt} E[S(0)]$ for any n.

(iii) Show that there is no risk-neutral model unless $d < e^{rdt} < u$.