1. Suppose that $X(t)$ follows the process $dX = \mu dt + \sigma dz$ where the parameters are positive constants and $z$ is a standard Wiener process.

Using Ito’s Lemma, find the process for $Y(t) = e^{X(t)}$.

2. Create a two-month binomial lattice model to find the value of a American put option with strike price $K = 55$, initial stock price $S(0) = 54$, volatility $\sigma = 0.33$, and annual interest rate $r = 0.12$.

Use $\Delta t = 1/12 \text{ yr.}$

3. An investor

buys 10,000 puts with strike $K_1 = \$60.00$ for $P = \$.65$ each, and

sells 10,000 puts with strike $K_2 = \$62.50$ for $P = \$1.55$ each.

Sketch the payoff and profit curves for this spread. Show the break-even point(s) where the profit is zero.

If you are the investor, what do you hope the stock will do?

4. a) Suppose we know that $C(S,t)$, the price of a European call, is a solution of the Black-Scholes equation. Let $P(S,t)$ be the price of a European put. Use the put-call parity formula $P(S,t) = C(S,t) + K e^{-r(T-t)} - S$ to show that $P(S,t)$ is also a solution of the Black-Scholes equation.

b) If $C$ obeys the boundary condition $C(S,T) = \max(S-K,0)$, what is the corresponding boundary condition for $P$?