

# Weekly Homework 7

Math 485

December 4, 2013

## 1 Text book problem

Page 133 Problem 1: a, b, c Problem 2 a, b, c

## 2 Additional problem

1. Verify that the following Ito's integral is a martingale using Ito's formula:

a.  $\int_0^t B_s^2 dB_s$ .

b.  $\int_0^t e^{B_s} dB_s$ .

c.  $\int_0^t B_s^3 dB_s$ .

2. Let  $s \leq t$ . Compute the following conditional expectations:

a.  $E(B_t^2 | B_s)$ .

b.  $E(e^{B_t} | B_s)$ .

c.  $E(\int_0^t B_r dB_r | B_s)$ .

3. Let  $S_t$  be a geometric Brownian motion:

$$dS_t = rS_t dt + \sigma S_t dB_t$$

$$S_0 = 10.$$

Suppose  $r = .05, \sigma = 0.2, T = 1$ . Compute the numerical value of  $E([(S_T)^2 - 10]^+)$ .

4. Let  $S_t$  be a geometric Brownian motion:

$$dS_t = rS_t dt + \sigma S_t dB_t$$

$$S_0 = 1000.$$

Suppose  $r = .05, \sigma = 0.2, T = 1, K = 1100$ .

Follow the procedure described in class, compute the Euro call on  $S_T$  with strike price  $K$  using:

- a. The Black-Scholes formula.
- b. The Binomial approximation to the Black-Scholes model with 5 steps.
- c. The Binomial approximation to the Black-Scholes model with 10 steps.