

# Maths 190 (Math'1 Methods in Finance) – 06 March 2017

## SUMMARY OF IMPORTANT POINTS DISCUSSED IN THE LECTURE

The following concepts were covered/reviewed:

1. **Three martingales of a Brownian motion (BM).** We showed the first 2 of the following results:

If  $W_t$  is a BM then the following are martingales:

- (i)  $W_t$
- (ii)  $W_t^2 - t$
- (iii)  $\exp(-\lambda W_t - \frac{1}{2}\lambda^2 t)$  for  $\lambda \in \mathbb{R}$ .

**Long exam 2 coverage until here!**

2. Motivation of stochastic differential equation (SDE): If  $X_t$  is a stochastic process, then its dynamics has two components, which are the drift and volatility parts. In particular

$$dX_t = \mu(X_t)dt + \sigma(X_t)dW_t.$$

In the above,  $\mu(X_t)$  is the drift and  $\sigma(X_t)$  is the volatility. If  $X_t$  consists only of the  $dt$  part, then it has only a deterministic component and such an equation is simply an ordinary differential equation.

3. The next discussions will cover basic introduction to the Calculus of Brownian motion leading to Itô's lemma (a result providing the tool to find the dynamics of  $C^{2,1}$  functions of BM).