Advanced Methods in Derivatives Pricing, Revision Checklist
MSc in Mathematics and Finance, 2016-2017
Imperial College London

As a general rule (in mathematics), proofs should NOT be remembered 'by heart', but definitions should be; without them, it is simply impossible to answer or solve properly any question or problem. Theorems and their assumptions should be understood and known, at least the 'simple' ones. Of course, long mathematical expressions and complicated formulae are not to be learnt by heart (for example, the function g in Theorem 2.1.25 characterising the convexity of Call option prices via the implied volatility). The following (indicative) list should help you make sure you do not miss any important points.

- Fatou's lemma, Dominated Convergence Theorem.
- Definition and properties of (local) martingales / supermartingales.
- Definition of European, American, Asian options.
- Itô's formula for diffusion processes and applications.
- Definitions of self-financing and admissible portfolios.
- Definition of a replicating trading strategy. Characterisation in complete markets (for example, hedging in Black-Scholes)
- Equivalent Local Martingale Measures and characterisation of option prices in a model-independent framework.
- Martingale Representation Theorem, Girsanov Theorem.
- Put-Call symmetry and Put-Call parity.
- Reflection property of Brownian motion
- Variance swaps and their (static) replication formula.
- No-arbitrage properties of call option prices and of the implied volatility surface.
- Black-Scholes formula.
- Roger Lee's Moment Formula: meaning, usefulness...
- Existence and uniqueness of solutions of stochastic differential equations.
- Markov property for diffusions.
- Kolmogorov equations and Feynman-Kac theorem.
- Definition of local / implied volatility.
- Definition of local times.
- Market incompleteness in the framework of stochastic volatility models. Market price of (volatility) risk.

Non-examinable sections from the notes

- Section 3.3 on non-linear PDEs.
- Section 3.4 on jumps and PIDEs.
- Section 4.2.5, 4.2.6, 4.2.7 on new classes of volatility models.
- Section 4.5 on the Skorokhod Embedding Problem.