Worksheet 3

There is a quiz for lecture 3 on Keats you can to test yourself on the basic ideas.

1) [⋆] Implement and test Simpson's rule.
(Solution: see the file `testIntegrateBySimpsonsRule.m` in `lecture3.zip`)

2) [⋆⋆] Use `rand` to generate uniformly distributed points in the unit square. Compute how many land in the unit circle. Hence estimate π.
(Solution: see the file `estimatePi.m` in `lecture3.zip`)

3) Adapt the code from the lectures to price a put option, a digital call option and a digital put option. Try using the **OVME** function on the Bloomberg terminals to test your answers.
(Solution: see the file `testPriceDerivativeByIntegration.m` in `lecture3.zip`)

4) [⋆] Derive a formula for the delta of an option in terms of the derivatives of the pricing kernel. Use this to compute the delta of an option using integration.
(Solution: see the file `testComputeDeltaByIntegration.m` in `lecture3.zip`)

5) [⋆⋆] Use the integral formulae for the price in terms of the payoff and Q^{-1} to price a call option by Monte Carlo integration and using the rectangle rule.
(Solution: see the file `testPriceByIntegrationUsingQ.m` in `lecture3.zip`)

6) Plot graphs of convergence of the two approaches.
(Solution: see the file `plotPricingErrors.m` in `lecture3.zip`)

7) Our estimates of the convergence of the integration methods assume a certain degree of differentiability in the integrand. Split the integrals your are performing into two integrals at the singularity and see if that improves convergence.
(Solution: see the file `priceCallInTwoPieces.m` in `lecture3.zip`)

8) [⋆⋆] Q1 from the mock exam.

9) Q1 from the "bonus questions".