Probability and Statistics
for Final Year Engineering Students

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Starred Exercises 1:
Introduction and Basic Terms

Starred Exercises:

1) Let U be a uniform [0,1] random variable and let F(x) be the CDF of a continuous random variable. Show that $F^{-1}(U)$ is a random variable with CDF F(x). Note $F^{-1}(.)$ Is the inverse of the CDF, it is well defined for the range of values in which F(x) is not 0 or 1. How can this be used for simulation?

2) X is an exponential random variable with mean μ if then density is $f(x) = \frac{1}{\mu} e^{-\frac{1}{\mu}x}$ for $0 \leq x$.
   a. Use integration by parts to show that $E[X] = \mu$.
   b. The value $\int x^k f(x) dx$ is the k'th moment. Calculate the second moment and from that the variance of X.
   c. Find a recursive formula for the k'th moment in terms of the k-1'th moment.

3) Consider a class room of n students. What is the probability that two or more students have the same birth day?