Tutorial (Uniform Distribution)

1. In the manufacture of petroleum the distilling temperature ($T°$C) is crucial in determining the quality of the final product. T can be considered as a random variable uniformly distributed over $150°$C to $300°$C. It costs $£C_1$ to produce 1 gallon of petroleum. If the oil distills at temperatures less than $200°$C the product sells for $£C_2$ per gallon. If it distills at a temperature greater than $200°$C it sells for $£C_3$ per gallon. Find the expected net profit per gallon.

2. Packages have a nominal net weight of 1 kg. However their actual net weights have a uniform distribution over the interval 980 g to 1030 g.

   (a) Find the probability that the net weight of a package is less than 1 kg.

   (b) Find the probability that the net weight of a package is less than w g, where $980 < w < 1030$.

   (c) If the net weights of packages are independent, find the probability that, in a sample of five packages, all five net weights are less than wg and hence find the probability density function of the weight of the heaviest of the packages. (Hint: all five packages weigh less than w g if and only if the heaviest weighs less that w g).