70001 Tutorial 4

1. Given a function evaluation f(x) = 0.5 at position **x** and another neighboring function evaluation f(x') = 0.7 at position **x'**, what is the probability of accepting a mutation from **x** to **x'** according the Metropolis-Hastings algorithm in the following two cases:

   (a) Assume that the mutation is proposed with uniform random perturbation.

   (b) Assume that the mutation is proposed with a transition probability T such that T(x → x') = 0.3 and T(x' → x) = 0.1.

2. If the path termination probability q = 0.75, then what is the probability of the path tracing to include the following number of bounces with Russian roulette (assume you apply it the first bounce onwards):

   (a) 2 bounces
   (b) 3 bounces
   (c) 4 bounces

3. Assume that 50 photons are deposited on a surface within a radius $r = 0.5$ m. Each photon is carrying a flux $\Delta\Phi = 2$ Watt. Compute the reflected radiance estimate at the surface assuming a diffuse BRDF of albedo $\rho_d = 0.5$.