COMP417, Fall 2019 Quiz 2

First Name:

Last Name:

Student #:

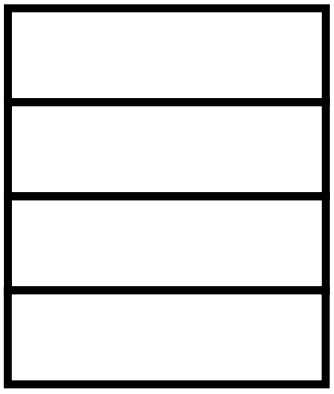
Q1: What properties does the Rapidly Exploring Random Tree (RRT) planner possess? Write True or False in each box.

a) Correctness:

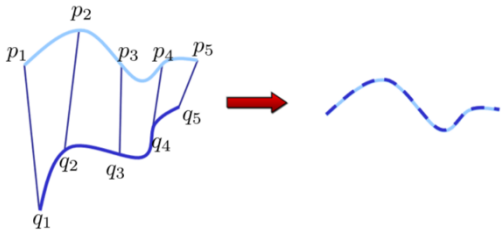
b) Path returned is "shortest":

c) Computation complexity that scales as $O(2^d)$ for state space with d dimensions:

d) Probabilistic completeness:



Q2: Recall our formulation of two laser range scans that need to be aligned, when we know the correspondence between points in the scans (the situation depicted in this image).
Write out the least squares error function in terms of the rotation "R" and the translation "t", such that the optimization will lead to the scans being perfectly aligned. You don't need to write down the solution to the optimization, just state the objective function.



Q3: The formulation occupancy grid mapping that we saw in class was:
$p(m_{ij} = 1|z_{1:t}, x_{1:t}) = \eta\, p(z_t|x_t, m_{ij} = 1)p(m_{ij} = 1|z_{1:t-1}, x_{1:t-1})$
This form has a normalization factor η which is expensive to compute, so we instead wrote the "log odds ratio", $l_t^{(ij)}$. Write that definition here (explain in English if you forgot the math).