HW 5

Recall from HW 4 problem 1 the problem of finding the intersection of two cubic Bezier curves. In this problem, we will find the closest points on two cubic Bezier curves $f$ and $g$:

$$\min_{t \in [0,1]^2} \|f(t_1) - g(t_2)\|.$$ 

1. Write a code to compute the Levenberg-Marquardt step $p$ for a given value of the damping parameter $\lambda$:

   ```matlab
   function [p] = bezier_lm_step(t, pf, pg, lambda)
   
   If lambda is not explicitly provided, your code should default to $\lambda = 0$ (a Gauss-Newton step).
   
   2. Use Gauss-Newton iteration with line search or Levenberg-Marquardt with adaptive $\lambda$ to solve the closest point problem.

   ```matlab
   function [s,t] = bezier_closest(pf, pg)
   
   % Compute points s in [0,1] and t in [0,1] such that 
   % the distance between $f(s)$ and $g(t)$ is minimized, where $f$ and $g$ 
   % are cubic Bezier curves with control points $pf$ and $pg$ (each of 
   % dimension d-by-4 with $d \geq 2$).
   
   You should not assume that the closest point is necessarily on the interior of the domain; you may deal with the end conditions via any reasonable approach, but a barrier or penalty may be simplest. If there are multiple local minima, it is OK to choose one.