Extra Credit 19

Chart, scatter chart

Description automatically generated

(Same question just from the textbook and more detailed)

**(a)**

**Solution:**

Let p be a set of n points in R3 such that not all of them lie in a common plane and no three of them are collinear.

* Let P0 be an extreme point of P that is a vertex of the convex hull of P.

Consider supporting plane to P at P0 and translate it into the side that contains P.

Let π denote the resulting plane.

Project from P0 all points of P \ {P0} on to π.

* We obtain a set R of n-1 distinct points in π , not all on a line and we will refer to them elements of R as red points.
* Each red point corresponds to direction determined by P0 and some other point of P.

For each pair of elements from plane P1 P` € P \ {P0} , take a line parallel to PP` that passes through P0 color with green the intersection points of this line with π unless it has been already in red color.

The set of all green points is denoted by G.

By definition of we have R ∩ G = Φ.

We need the following simple property of the sets R and G which implies that a long every line passing through at least two red points either the left most or the right most point belonging to R ∪ G is green.

Thus at least two red points belongs to R ∪ G

(b)

**Solution:**

Let P be a set of n = 2m points in general position in the plane. Let {R, G} be a position of P such that |R| = |G| = m.

Consider the points in R are colored red and the points in B are colored as green.

* It is well known that kn (R, G) has plane R G matching. In fact, a minimum weight of R G matching that is called perfect matching.
* Perfect matching that minimizes the total Euclidean length of edges .

A minimum weight RG –matching in kn (R, G) can be computed in O(n2 log n) time.