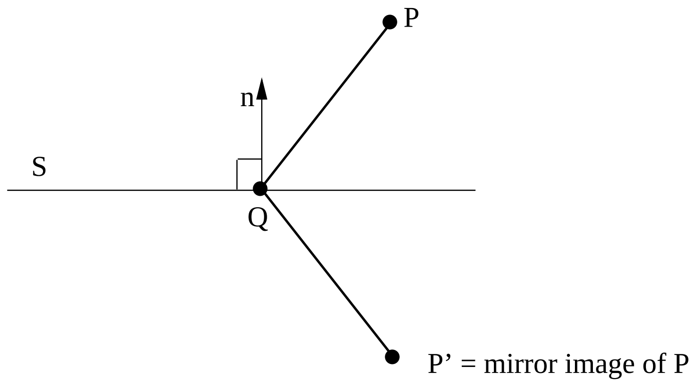
Graphics B-Exam Spring 1996

1. (a) Explain the difference between a model (object) space algorithm and an image space algorithm.
   (b) Describe in detail one object space hidden surface algorithm.
   (c) Describe in detail one image space hidden surface algorithm.

2. Prove that reversing the order of the control points of a Bezier curve generates the same curve but with opposite orientation. In other words if $B[P_0, ..., P_n](t)$ denotes the degree n Bezier curve with control points $P_0, ..., P_n$, prove that
   $B[P_n, ..., P_0](t) = B[P_0, ..., P_n](1 - t)$.

3. Let S be a plane defined by a point Q and a unit normal vector n.
   (a) Find a formula to express the mirror image P' of a point P in the plane S. Your formula for P' should be expressed in terms of the points P,Q and the unit vector n (see diagram).
   (b) Find a matrix representation of the mirror image transformation developed in part (a) in terms of the coordinates of Q and n.



4. (a) Find an iterated function system (IFS) that generates the fractal in the figure below.
   (b) What is the fractal dimention of the black part of the figure?
   (c) What percentage of the area of the outer square is contained in all the white squares?