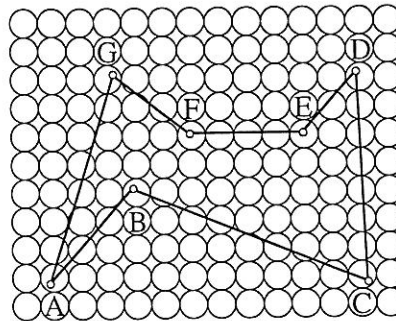


1. (a) Compute the intersection of the line segment $X = A + t(B - A)$, $0 \leq t \leq 1$, and the half space $X \cdot n \leq a$ and interpret the resulting cases geometrically. (2p)
- (b) A slab is a region bounded by two parallel hyperplanes. Define a slab mathematically and extend the result in (a) to intersection between a segment and a slab. Why is this intersection calculation more efficient than intersecting with two half spaces separately? (2p)
- (c) How does using a canonical clipping region, where the clipping planes are parallel to coordinate planes and the limits are either $[-1, 1]$ or $[0, 1]$, make clipping computations more efficient? (Hint: Write out the vectors in the inequalities in components in e.g. the 2D case, compute the dot products, and compare the number and complexity of the remaining arithmetic operations to the general case). (2p)
2. (a) Describe in stages starting from initialization how scanline fill fills the polygon below. You do not have to draw all intermediate stages, but illustrate your explanation with a figure. (3p)



- (b) How can scanline fill be made more efficient in the case of a convex polygon and a triangle? (1p)
- (c) In 3D graphics the rasterized polygons are often from polygon meshes that describe the surface of a 3D object. The polygons share vertices and edges. Why is it important in this case that a pixel is filled only once when rasterizing the surface polygons and how would you solve which polygon a pixel belongs to when it is on an edge shared between two polygons (or a shared vertex)? (2p)
3. Describe the stages of view definition and coordinate systems in 3D viewing from model coordinates to the screen. Explain the stages briefly. (6p)
4. Essay: Visibility determination / hidden surface removal (6p)