Be sure to read the instructions on the assignments section of the class web page. Remember to keep your solutions to one page!

Orthogonal line segment intersection. Given a set of \( N \) horizontal and vertical line segments, develop and analyze a cache-oblivious algorithm to find the number of vertical segments intersecting each horizontal segment in \( O\left(\frac{N}{B} \log_{M/B} \frac{N}{B}\right) \) memory transfers. You may assume that the endpoints of any two different line segments do not have the same \( x \) or \( y \) value.

Line segment visibility from a point. Given a set of \( N \) line segments and a point \( p \), we would like to find the clockwise list of partial line segments visible from \( p \). A (partial) line segment is visible from \( p \) if, for any point along the segment, a line can be drawn from that point to \( p \) without intersecting any other line segment. If a line segment is only partially visible from \( p \), then only the segment that is visible should appear in the output list. A single line segment may contain many partial segments in the output list. Develop and analyze a cache-oblivious algorithm to accomplish this in \( O\left(\frac{N}{B} \log_{M/B} \frac{N}{B} + \frac{K}{B}\right) \) memory transfers, where \( K \) is the size of the output. You may assume that no two points in the input lie along the same line to \( p \), and that no two line segments intersect.