

Intersecting Line Segments

The problems so far have been reasonably straightforward for both you and the computer. Let's explore a little further. Look at the line segments in the following three figures. In which figures do the line segments intersect?

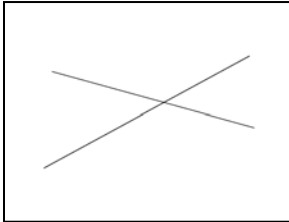


Figure 4

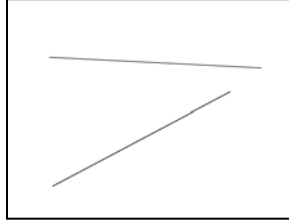


Figure 5

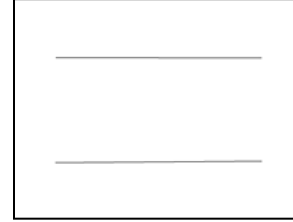
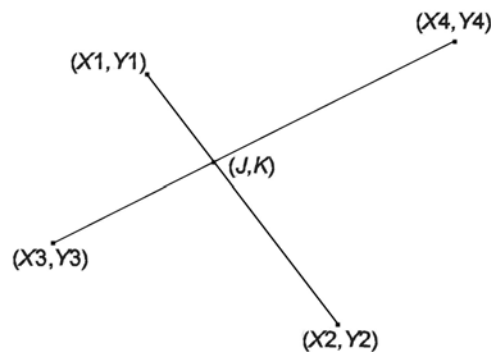


Figure 6

Could the question really be so easy to answer? Obviously the segments in Figure 4 intersect and the segments do not intersect in the other two figures. Easy for you! Now let's examine what must be done to have a computer answer the same question.

To have a computer answer the same question, one can assume that the coordinates of the end points of each line segment are known. This assumption is reasonable because a computer would need to have the coordinates of the endpoints to display a line segment on a screen. A computer can be programmed to use the coordinates of the endpoints to compute the equations of the two lines containing the two line segments, and then to calculate the coordinates of the point of intersection of the two lines. Sound familiar? If you haven't completed the program proposed in problem P18, now is a good time to do so. We're going to build on that program in the remainder of this section.

An illustration of what was just described is:



Here's the situation. The values of (X_1, Y_1) through (X_4, Y_4) are all known, and the values of (J, K) , the computed coordinates of the point of intersection, are also known. We now need to know if (J, K) is contained by each of the given line segments rather than elsewhere on the line. How do we know, for example, that (J, K) isn't located as in the following illustration?