1. Let \( P \) be a point on the line \( \overrightarrow{AB} \) and \( l \not= \overrightarrow{AB} \) be a line containing the point \( A \).
   a. Prove that if \( P \in \overrightarrow{AB} \), then \( P \) and \( B \) are on the same side of \( l \). (Hint: Use proof by contradiction)
   b. Prove that if \( P \) and \( B \) are on the same side of \( l \), then \( P \in \overrightarrow{AB} \)

Notice that part a and b together gives the following result:
\( P \in \overrightarrow{AB} \) if and only if \( P \) and \( B \) are on the same side of \( l \).

2. Name the Theorem, Proposition or Axiom that justifies each of the following: (It is possible that more than one is needed.)
   a. Let \( P \in \overrightarrow{AB} \), then there is a line \( l \not= \overrightarrow{AB} \) such that \( l \) contains the point \( P \).
   b. Let \( l \) be a line. If \( A \not\in l \), then there is a line \( m \) that contains the point \( A \) and \( m \cap l \not= \emptyset \).
   c. Let \( A, B, \) and \( C \) be three distinct collinear points such that \( A \) is between \( B \) and \( C \). For each point \( D \in \overrightarrow{AB} \) where \( D \not= A \), if \( D \not\in \overrightarrow{AC} \) then \( D \in \overrightarrow{AB} \)
   d. Given and angle \( \angle EFG \), let \( D \) be a point such that \( D \in \overrightarrow{EG} \), \( D \) is distinct from both \( E \) and \( G \), then \( D \) is interior to \( \angle EFG \).
   e. Given and angle \( \angle EFG \), and a point \( D \in \overrightarrow{EG} \), \( D \) is distinct from both \( E \) and \( G \), every point which is between \( F \) and \( D \) is interior to \( \angle EFG \).
   f. Given and angle \( \angle EFG \), and a point \( X \), which is interior to \( \angle EFG \), there is a point \( D \), such that \( D = \overrightarrow{FX} \cap \overrightarrow{EG} \)