7.3 Consider whether the following statements are true or false:

  a. The intersection of any two convex sets is convex.

   Solution.

   Let x and y belong to the intersection of two convex sets A and B. Then, any line connecting them also lies inside both A and B. Therefore, the intersection of two convex sets is also convex.

  b. The union of any two convex sets is convex.

   Solution.

   Let x belong to a convex set A and let y belong to a convex set B. It is possible that $A \cap B = \phi$ (such as 2 parallel lines), so that any line connecting x and y is partly outside both sets.

   Therefore, the union of any two convex sets is not necessarily convex.

  c. The difference of a convex set A from another convex set B is convex.

   Solution.

   $A - B$ is the set that is obtained by removing the elements of $A \cap B$ from A.

   Let x and y belong to $A - B$. Then, a line connecting them might go through $A \cap B$, which has been subtracted from $A - B$.

   So, the difference of a convex set A from another convex set B is not convex.