

Name: .....

Fill in the blanks!

**Definition 1.** A topological space  $X$  is *compact* if and only if .....

.....  
.....

**Definition 2.** A topological space  $X$  is *disconnected* if and only if .....

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.....

**Definition 3.** A topological space  $X$  is *separable* if and only if .....

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.....

**Proposition 4.** Let  $X$  be a topological space. If  $X$  is .....-countable, then  $X$  is separable.

Conversely, if  $X$  is separable and ....., then  $X$  is second-countable.

**Proposition 5.** Let  $X$  and  $Y$  be topological spaces, and let  $f: X \rightarrow Y$  be a continuous bijective function.

If  $X$  is ..... and  $Y$  is ....., then  $f$  is a homeomorphism.

**Proposition 6.** Let  $X$  be a topological space, and let  $A$  and  $B$  be subspaces of  $X$ . If  $A$  is connected

and .....,

then  $A \cup B$  is connected.