Note: The book has Exercises, which are interspersed among the prose, and Problems, which appear at the ends of the chapters. It can be easy to confuse the two. Exercises are denoted in blue.

1. Suppose $\mathcal{B}_X$ and $\mathcal{B}_Y$ are bases for X and Y respectively. Show that $\mathcal{B} = \{U \times V : U \in B_X, V \in B_Y\}$ is a basis for $X \times Y$.

2. Suppose $A \subset X$ and $B \subset Y$. Use the fact that the characteristic property of the product topology is characteristic to show that the subspace topology on $A \times B$ is the the same as its topology as a product of subspaces.

3. Show that $(X_1 \times X_2) \times X_3$ is homeomorphic to $X_1 \times X_2 \times X_3$. You may not use the words "open" or "closed" at any point in your proof. (*Hint:* Use the Characteristic Property, Luke!)

4. Prove the following.

a) A projection map from an arbitrary product space is an open map.

b) An arbitrary product of Hausdorff spaces is Hausdorff

c) A countable product of second countable spaces is second countable.

5. Problem 3-8

6. Problem 3-9

7. Problem 3-13 a

8. **Exercise 3.61**

9. This is a heads up: problem 3-14 will be on the next homework. Start thinking about it now.