TOPOLOGY HOMEWORK 13 DUE NOVEMBER 30

(1) Do problem 30.12 on page 194.
(2) Do problem 30.13 on page 194.
(3) Do problem 17.12 on page 101.
(4) Do problem 17.13 on page 101.
(5) Do problem 17.14 on page 101.
(6) Do problem 18.2 on page 111.
(7) Do problem 18.3 on page 111.
(8) Do problem 18.6 on page 111. The general definition of continuity at a point is on page 104, but feel free to use the ε-δ definition. Hint: Consider the function that is 1 on the rationals and 0 on the irrationals. Can you use that sort of idea to get a function that is continuous at precisely one point?
(9) Do problem 18.13 on page 112. It's tempting (and useful for intuition) to think about limit points, but because there is no first countability assumption, there is no guarantee that a limit point is the limit of a sequence. Instead, use the definition of Hausdorff directly. Theorem 17.4 will alleviate a technical issue, but don't worry about it until you get there.
(10) Do problem 21.2 on page 133. A function $f\colon X \to Y$ is an *imbedding* if the restriction $f\colon X \to f(X)$ is a homeomorphism, where $f(X) \subseteq Y$ is given the subspace topology. An example to think about is the map $\mathbb{R} \to \mathbb{R}^2$ defined by $x \mapsto (x, 0)$. Note in particular that the image of an open set in $\mathbb{R}$ is not open in $\mathbb{R}^2$.
(11) Do problem 21.7 on page 134.
(12) Do problem 21.8 on page 134.
(13) Do problem 21.9 on page 134.