**Motivation:**
To begin with, let us define any connected open set that contains a point \( p \) to be a neighborhood of \( p \). For example, an open ball of radius \( \delta > 0 \) about \( p \), which is the set of all \( x \) such that \( ||x - p|| < \delta \), is a neighborhood of \( p \). Any open rectangle containing \( p \) is also a neighborhood of \( p \).

![Diagram of neighborhood and open sets]

From: [http://math.etsu.edu/multicalc/Chap2/Chap2-2/index.htm](http://math.etsu.edu/multicalc/Chap2/Chap2-2/index.htm)

**Extreme Value Thm:** If \( f: [a, b] \rightarrow \mathbb{R} \) is continuous, then \( \exists \ c, d \in [a, b] \) s.t. \( f(c) \leq f(x) \leq f(d) \ \forall \ x \in [a, b] \).

![Graph of Extreme Value Theorem]

http://www.sparknotes.com/math/calcab/applicationsofthederivative/section3.rhtml

What is the minimum hypothesis such that the Extreme Value Theorem holds: Suppose \( f: X \rightarrow Y \)... Some common symbols:

- \( \exists \) = there exists
- \(! = unique \ \exists ! = there exists a unique \)
- \( \forall = for \ all \ \ \exists = s.t. \ = such \ that \)

\( y \in Y \): lower case = element  
Upper case = set  
Caligraphy \( \{ \text{\text{cal \ Y}} \} = \text{collection of sets.} \)

Want to learn more about point-set topology:  

Use MSC Primary: 54 for general topology  
To find other MSC numbers: [http://www.ams.org/mathscinet/searchMSC.html](http://www.ams.org/mathscinet/searchMSC.html)

If you are off-campus, you will need to log into MathSciNet via the Math Library website:  
[http://www.lib.uiowa.edu/math/index.html](http://www.lib.uiowa.edu/math/index.html)

Note most articles found by MathSciNet are research articles. Unfortunately, this class will not prepare you to read most of these articles—but don’t let that stop you if you have an interest in them.