MATH 472
Guidelines for Exam 2

- **Theorems/Lemmas/Propositions you are expected to be able to state and prove**:

  1. $\mathbf{u} \in \mathbb{R}^n$ and $\mathbf{v} \in \mathbb{R}^n$ are orthogonal if and only if the Pythagorean identity holds.
  2. The Cauchy-Schwarz Inequality
  3. The triangle inequality for vectors in $\mathbb{R}^n$
  4. The intersection of a finite number of open sets is open.
     The union of an arbitrary collection of open sets is open.
  5. The following are equivalent:
     (a) $f : D \to \mathbb{R}$ is continuous
     (b) For every open set U in $\mathbb{R}$, $f^{-1}(U)$ is open in D
     (In class, we proved only one direction and that is enough for the test.)

- **Theorems/Lemmas/Propositions you are expected to be able to apply**:

  1. All of the above
  2. All the results discussed for power series
  3. Componentwise Convergence Criteria - A sequence $\{\mathbf{u_k}\}$ in $\mathbb{R}^n$ converges to $\mathbf{u}$ if and only if $\{\mathbf{u_k}\}$ converges componentwise to $\mathbf{u}$.
  4. The union of a finite number of closed sets is closed.
     The intersection of an arbitrary collection of closed sets is closed.
  5. The following are equivalent:
     (a) $f : D \to \mathbb{R}$ is continuous at a point $\mathbf{x_0}$ (the ϵ-δ criterion holds at $\mathbf{x_0}$)
     (b) For every convergent sequence $\{\mathbf{x_k}\} \to \mathbf{x_0}$ in D, $\{f(\mathbf{x_k})\}$ converges to $f(\mathbf{x_0})$
  6. Clairaut's Theorem
  7. Directional Derivative Theorem

- **Must be able to clearly state all the definitions:** For example: open ball, interior point, open sets, closed sets, accumulation point, limit and continuity at a point, continuously differentiable function, etc.

- **Be familiar with all the examples discussed in class.**

- **Be familiar with all the problems from Homeworks 4, 5.**

- Note: In the lectures, an arrow over a letter is used to indicate that the object is a vector. In print, a boldfaced letter is used to indicate a vector. Be mindful of this while reading questions.