(Math 360) Multiple Choice Final:

April 23, 2009

Practice Problems

(1) Is the following true for all complex x?

$$\left|\sum_{j=1}^{n}(1+x)^j\left(\frac{j}{x^j}\right)\right|^2 \leq \sum_{j=1}^{n}|1+x|^{2j}\sum_{j=1}^{n}\left|\frac{j}{x}\right|^2$$

- True
- False

(2) Suppose $\{s_n\}$ is a convergent sequence of complex numbers and $\{s_{n_k}\}$ is a subsequence. Must $\{s_{n_k}\}$ converge?

- Yes
- No

(3) What does $\lim_{n\to\infty}\sqrt[n]{n}$ equal?

(a) 0

(b) 1

(c) e.

(d) ∞.

(4) Suppose $\sum|a_i|$ converges and $\sum a_i = 2$. Is there a rearrangement a_{i_k} of the terms such that $\sum a_{i_k} = 4$?

- Yes
- No

(5) Is it possible to have a function which is not continuous anywhere?

- Yes
- No

(6) If $f(x), g(x) : \mathbb{R} \to \mathbb{R}$ are continuous functions must $f(g(x))$ be continuous?

- Yes
- No

(7) Suppose $\{f_n\}$ is a sequence of continuous functions on $[a, b]$ such that $(\forall x \in [a, b])(\forall n \in \mathbb{N})|f_n(x)| \leq M_n$ and $\sum M_n$ converges. Must $\sum f_n$ converge uniformly to $\sum f$?

- Yes
- No

(8) If $f^2(x)$ is integrable on $[a, b]$ must f be integrable on $[a, b]$?

- Yes
- No

(9) If A is disconnected must the closure of A be disconnected?

- Yes
- No

(10) Suppose $f : X \to Y$ and $g : Y \to X$ are maps such that $(\forall x \in X) g(f(x)) = x$, $(\forall y \in Y) f(g(y)) = y$ and f is continuous. Must g be continuous?

- Yes
- No