MAA 4211 PRACTICE TEST 1 FALL 2017 - JAMES KEESLING

Name: _____

Do all problems and show all work. Each problem worth 20 points. Partial credit will be given for correct work even if the answer is wrong. Credit will be deducted for incorrect work even though the final answer may be correct.

Problem 1. State the **Least Upper Bound Property** for the real numbers.

Problem 2. Show that for all $|x| < 1$, $\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}$.

Problem 3. Suppose that $f : [a, b] \to \mathbb{R}$ is continuous and that $f([a, b]) \supset [a, b]$. Show that there is an $x \in [a, b]$ such that $f(x) = x$.

Problem 4. Show that if $A \subset \mathbb{R}$ is not an interval, then A is not connected.

Problem 5. Show that $\sum_{n=1}^{\infty} \frac{1}{n}$ does not converge.

Problem 6. Show that $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$ converges.

Problem 7. Let $f : \mathbb{R} \to \mathbb{R}$ be continuous. Suppose that $f(x)$ has a point of period three. Show that it has a point of period 7. How many points of period 7 can you guarantee?

Problem 8. Suppose that A is an interval. Show that A is connected.

Problem 9. State and prove the Bolzano-Weierstrass Theorem.