

Math 316 – Homework 1 – due Wednesday, February 4

Problems to complete

1. Consider the functions $f_n(x) = \frac{1}{n^2x^2+1}$ and the derivatives $f'_n(x) = -\frac{2n^2x}{(n^2x^2+1)^2}$. Show that each converges pointwise to zero for all x but not uniformly.
2. Prove that the sum defining the Riemann zeta function $\zeta(x) = \sum_{k=1}^{\infty} \frac{1}{k^x}$ converges uniformly on $[a, \infty)$ for any $a > 1$. Then show the zeta function is differentiable for $x > 1$ and compute the derivative.
3. Problem 8 of text, section 7.2, page 197.
4. Problem 7 of text, section 7.3, page 207.
5. Problem 2 of text, section 7.4, page 216.