

Take-Home Exam #2

Math 425-A

Due in Class: Tuesday, November 10, 1998

You may consult any inanimate reference, e.g., your text, your notes, and library texts. You are honor-bound not to consult your class-mates, other faculty members, or any other person.

1. Use the definition of continuity from our text to show that the following function is continuous at $x = 1$: $f(x) = 2x^3 + 4x^2 + 5x - 7$.
2. Use the definition of compactness from our text to determine whether or not the following set is compact: $S = \{x \mid 0 \leq x \leq 1, x \in \mathbf{Q}\}$. Prove your conclusion.
3. Prove or disprove that the following function is uniformly continuous: $f(x) = \ln x$, with $x > 0$.
4. Use the definition of the derivative to find $f'(x)$ where $f(x) = 2x^3 + 4x^2 + 5x - 7$.
5. Give an example of a continuous function with a disconnected domain and connected image. Be sure to justify all three parts, i.e., that your function is continuous, that your domain is disconnected, and that your image is connected.