

Epsilon-Delta Proofs Practice

Just for practice, don't use Google to cheat!

1. Use an ϵ - δ proof to prove $\lim_{x \rightarrow 2} \frac{1}{2}x = 1$.
2. Use an ϵ - δ proof to prove $\lim_{x \rightarrow -2} (-3x + 1) = 7$.
3. Use an ϵ - δ proof to prove $\lim_{x \rightarrow 3} (6x - x^2) = 9$.
4. Consider the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined as

$$f(x) = \begin{cases} 1 & \text{if } x \text{ is rational} \\ 0 & \text{if } x \text{ is irrational.} \end{cases}$$

At which values of x is $f(x)$ continuous? You can assume without proof the fact that between every two rationals, there is an irrational and between every two irrationals, there is a rational.

5. Give an example of a function f such that f is continuous nowhere, but $|f|$ is continuous everywhere. *Hint:* Think about problem 4.