MATH2050
Tutorial

November 23, 2022

1. Can a continuous function take an open interval to closed interval? Can it take a closed interval to open interval?
2. Must a uniformly continuous function be Lipschitz? Must a monotone function be Lipschitz?
3. If a monotone function has an inverse function (not necessarily continuous), is it be discontinuous somewhere?
4. Prove again the theorem that a monotone function have at most countable number of discontinuties. Can such set of discontinuous points be dense?
5. Is the convex conjugate defined below continuous for continuous function f?

$$f^*(x^*) := \sup\{\langle\, x^*\,,\, x\,\rangle - f(x) : x \in \mathbb{R}\}$$

6. If I declare a set of function to be continuous (defining so-called topology), what can be possible set that are open?
7. Section 5.1, Q15
8. Section 5.2, Q6, 11
9. Section 5.3, Q16, 18
10. Section 5.4, Q16
11. Section 5.6, Q7