

**Eighth Homework: MATH 410**  
**Due Wednesday, 23 October 2019**

1. Prove that if a function  $f : (a, b) \rightarrow \mathbb{R}$  is differentiable and convex over  $(a, b)$  then  $f' : (a, b) \rightarrow \mathbb{R}$  is nondecreasing over  $(a, b)$ .
2. Show that the assertion of Proposition 6.9 on page 21 of the class notes is false if we replace  $(a, b)$  with either  $(a, b]$ ,  $[a, b)$ , or  $[a, b]$ .
3. Prove assertions (6.24) and (6.25) of Proposition 6.10 on page 22 of the class notes.
4. Exercise 1 of Section 4.3 in the text.
5. Exercise 7 of Section 4.3 in the text.
6. Exercise 11 of Section 4.3 in the text.
7. Exercise 12 of Section 4.3 in the text.
8. Exercise 16 of Section 4.3 in the text.
9. Exercise 20 of Section 4.3 in the text.
10. Exercise 21 of Section 4.3 in the text.
11. Prove the assertion of Proposition 7.8 on page 28 of the class notes that  $L$  is the smallest possible Lipschitz constant.
12. Prove that  $f(x) = e^{-2x} \cos(3x)$  is Lipschitz continuous over  $[0, \infty)$  and find its smallest possible Lipschitz constant.
13. Suppose we are using the Newton-Raphson method to solve  $x^2 - 56 = 0$ . Use Proposition 7.11 on page 31 of the class notes to bound the error when our initial guess is 8.
14. Exercise 2 of Section 8.1 in the text.
15. Exercise 4 of Section 8.1 in the text. It should read "... strictly decreasing derivative."