

MAT 319 Introduction to Analysis

**Homework 11**

due Thursday, May 3

Please prove (or explain as appropriate) all your answers.

**Question 1.** Suppose that  $f$  is differentiable at  $x_0$ , and  $f'(x_0) < 0$ . Prove that in some neighborhood of  $x_0$ , we have

$$\begin{aligned} f(x) &> f(x_0) \text{ for every } x < x_0, \\ f(x) &< f(x_0) \text{ for every } x > x_0. \end{aligned}$$

(We proved a similar statement in class for the case  $f'(x_0) > 0$ . Please mimic the proof of that statement here, working from definitions.)

Do question 29.7 from the book. **Hint:** use corollary 29.4 on p.216.

Do questions 29.13 and 29.14. **Hint:** use corollary 29.7 on p.217.

Do question 29.5. **Hint:** prove (from definition) that  $f'(x) = 0$  if the function satisfies the given inequality.