

Homework 4 - Math 141, Frank Thorne (thornef@mailbox.sc.edu)

Due Monday, September 21

- (a) Draw a graph of a function which is not differentiable, and geometrically explain why it is not differentiable.
- (b) Give an equation of a function which is not differentiable, and algebraically explain why it is not differentiable. (You can use the same function or a different function.)
- (c) Give the definition of the *derivative* of a function $f(x)$ at the point $x = a$. (Please give the algebraic definition, using an equation.)
Draw a picture and explain why your equation gives the slope of the tangent line to the graph of $f(x)$ at $x = a$.
- (d) Thomas, Ch. 3.2: 27-32.
- (e) Thomas, Ch. 3.2: 7-10, 13-14, 19, 20, 23-26, 43-48. Even required; odd additional. **Instructions:** You may use the definition, the 'alternative formula', and any other techniques in this chapter at your discretion. Do not use the differentiation rules introduced in later chapters.
- (f) Thomas, Ch. 3.3: 17-34 (even required, odd additional), 57, 58.
- (g) Thomas, Ch. 3.5: 1-14, 35-38 (even required, odd additional).
If $f(x) = c$, where c is a constant, find $f'(x)$ using the definition. Draw a picture which explains your conclusion.
- (h) What is the 500th derivative of $f(x) = x^{100}$? Explain why.