Practice Problems 3 - Math 141, Frank Thorne (thornef@mailbox.sc.edu)

Any of these problems that might appear on a quiz, assessment, or the final exam. You will be expected to show your work, write in complete sentences, and explain your reasoning clearly.

Instructions. You may use the definition, the 'alternative formula', and any other techniques **in Chapters 3.1 or 3.2** at your discretion. The instructions 'use the alternative formula' in 3.2, 23-26 are optional. But **do not use the differentiation rules introduced in later chapters.**
The same is true for any question on a quiz, assessment, or exam which asks you to compute a derivative 'directly from the definition'.

(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) What is the *average rate of change* of a function $f(x)$ on an interval $[a, a + h]$, and what is the *instantaneous rate of change* of $f(x)$ at $x = a$?

Explain the relationship between these two concepts, and their relationship to the derivative.

(e) Thomas, Ch. 3.1, 11-24, 29-32.

(f) Thomas, Ch. 3.2, 1-31, 43-52.