

**Math 108, problem set 01a**  
**Due: Mon Jan 28**  
**Last revision due: Wed Feb 13**

**Problems to be turned in:**

**Problems 1–4:** For each of the theorems listed in these problems, separate the theorem into assumptions and conclusions. Do not try to prove any of the theorems. Note that you should be able to do this outlining exercise even if you don't know or don't remember the definitions of some of the terms involved; nevertheless, except for the last theorem, you should have already seen all of these theorems before, in calculus or an earlier class.

1. **Fundamental Theorem of Calculus.** If  $F'(x) = f(x)$  on  $[a, b]$ , and  $f$  is continuous on  $[a, b]$ , then  $\int_a^b f(x) dx = F(b) - F(a)$ .
2. **Extreme Value Theorem.** If  $f$  is continuous on a closed interval  $[a, b]$ , then  $f$  attains an absolute maximum value  $f(c)$  and an absolute minimum value  $f(d)$  at some numbers  $c$  and  $d$  in  $[a, b]$ .
3. **Fermat's Theorem.** If  $f$  has a local minimum or local maximum at  $c$ , and  $f'(c)$  exists, then  $f'(c) = 0$ .
4. **Theorem.** If  $v_1, v_2, v_3, v_4, v_5$  are contained in  $\mathbf{R}^n$ , then

$$\text{span} \{v_1, v_2, v_3\} \subseteq \text{span} \{v_1, v_2, v_3, v_4, v_5\}.$$

**Problems 5–8:** These are puzzles from the *What is the name of this book?* excerpts in the Math 108 Course Reader. Solve each puzzle, briefly explaining/justifying your answer.

5. Puzzle 34 (p. 22).
6. Puzzle 110 (p. 103).
7. Puzzle 115 (p. 104).
8. Puzzle 122 (p. 107).