

Math 1A Worksheet 21

March 31st, 2008

1. The most important thing about l'Hospital's Rule is to know when you *can* and *cannot* apply it.
 - a) Find $\lim_{x \rightarrow 0} \frac{x}{x+1}$. Did you need to use l'Hospital's Rule?
 - b) What value would you have gotten if you had tried to use l'Hospital's Rule? Why does l'Hospital's Rule not apply in this situation?

2. Find

$$\lim_{x \rightarrow 0^+} \frac{\cosh x}{\sinh x}.$$

3. Find the domain and range of each of the following functions:
 - a) $f(x) = \sin^{-1}(e^x)$,
 - b) $f(x) = \cosh^{-1}(\sin x)$,
 - c) $f(x) = \tan(x + 1)$.

4. True or false? (If false, give a counterexample):
 - a) If f has a local extremum at c , then c is a critical number of f . [Note: "extremum" means "maximum or minimum."]
 - b) If c is a critical number of f , then f has a local extremum at c .
 - c) Every function has a local extremum.

5. (If time) Let f be a twice-differentiable function such that f'' is continuous. Use l'Hospital's rule to find

$$\lim_{h \rightarrow 0} \frac{f(x+h) - 2f(x) + f(x-h)}{h^2}.$$

[Note: be *very* careful about which variable you are differentiating with respect to!]