Math 221 CD1: Worksheet 12  
October 6, 2017

No calculators, graphing or otherwise, are permitted on this worksheet!

1. Compute the values of sinh(ln(7)) and cosh(ln(9)).

2. (a) Show that the derivative of sinh(x) is cosh(x).
   (b) Show that the derivative of cosh(x) is sinh(x).
   (c) Find the derivative of \( g(u) = e^{\cosh(7u)} \sinh(u^2) \).

3. Find an expression for \( \sinh^{-1}(x) \), the inverse function of sinh(x).

4. (a) Give the definition of an absolute maximum of a function \( f \) on a domain \( D \).
   (b) Give the definition of an absolute minimum of a function \( f \) on a domain \( D \).
   (c) State the Extreme Value Theorem. Give an example of a function on a closed interval that does not attain either an absolute maximum or an absolute minimum. (You may give your function algebraically or graphically.) Does this contradict the Extreme Value Theorem? Why or why not?
   (d) Prove that the function \( \sin \left( e^{\cos(x^2 + 7x^{10} - 13x + 9 + \ln(x^2 + 1))} \right) \) attains both an absolute maximum and an absolute minimum on the interval \([1, 7]\). Does it attain an absolute maximum and an absolute minimum on \([-432152, -10003]\)? Why or why not?

5. Find any absolute maxima and absolute minima of the function \( f(x) = 2x(x + 3)^{2/3} \) on the interval \([-4, -2]\).

6. Find any absolute maxima and absolute minima of the function \( f(x) = 3 - |x - 2| \).

7. (a) Give the definition of a local maximum of a function \( f \).
   (b) Give the definition of a local minimum of a function \( f \).
   (c) Is it true that if \( f'(c) = 0 \) for some \( c \) in the domain of \( f \), then \( f \) has a local maximum or local minimum at \( c \)? If it is true, prove it; if not, give a counterexample.