

Math 1A Worksheet 11

February 25th, 2008

1. Let $g(x) = |\sin x|$. At what points is $g(x)$ differentiable? Give a formula for $g'(x)$ and sketch its graph. (Hint for finding a nice formula: $|x| = \sqrt{x^2}$.)
2. Use the chain rule to show that the derivative of an even function is an odd function and the derivative of an odd function is an even function. Suppose $g(x)$ is a differentiable even function. Find $g'(0)$. Suppose $h(x)$ is an odd function. Must it be true that $h'(0) = 0$?

3. Find the following limits:

a)

$$\lim_{x \rightarrow 0} \frac{\sin(\sin x)}{\sin x},$$

b)

$$\lim_{x \rightarrow \infty} x \sin\left(\frac{1}{x}\right),$$

c)

$$\lim_{x \rightarrow \infty} \left(x - x \cos\left(\frac{1}{x}\right)\right).$$

4. Give examples of the following:

a) Two functions f and g such that $\lim_{x \rightarrow 0} f(x)$ and $\lim_{x \rightarrow 0} g(x)$ exist, but

$$\lim_{x \rightarrow 0} (f \circ g)(x)$$

does not.

b) Two functions f and g such that $\lim_{x \rightarrow \infty} f(x) = \infty$, $\lim_{x \rightarrow \infty} g(x) = -\infty$, and

$$\lim_{x \rightarrow \infty} (f \circ g)(x) = 0.$$