

**Introduction to Analysis 2**  
**Home Work 1, due Wednesday, January 25.**  
**Instructor: Prof. Artem Zvavitch**

**Problem 1.** *Construct an example of a continuous function  $f(x)$  which is not differentiable at points  $x = -1$ ,  $x = 1$ ,  $x = 3$ .*

**Problem 2.** *Construct an example of a differentiable NONCONSTANT function  $f(x)$  such that  $f'(-1) = f'(0) = f'(1) = 0$ .*

**Problem 3.** *Construct an example of continuous functions  $f(x)$ ,  $g(x)$  and  $h(x)$  such that  $f(x) = g(x)h(x)$ ,  $f(x)$  and  $g(x)$  are differentiable at point  $x = 0$ , but  $h(x)$  is not differentiable at this point.*

**Problem 4.** *Is it true that if  $f'(x) = g'(x)$  for all  $x \in \mathbb{R}$ , then  $f(x) = g(x)$  for all  $x \in \mathbb{R}$ ? Is it true that if  $f'(x) < g'(x)$  for all  $x \in \mathbb{R}$ , then  $f(x) < g(x)$  for all  $x \in \mathbb{R}$ ?*

**Problem 5.** *Consider a differentiable even function  $f(x)$  (even =  $f(x) = f(-x)$ ). Show that  $f'(0) = 0$ .*