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 $f'(0) = 0$.

Problem 6. Prove that for any real numbers $x, y$:

$$|\sin x - \sin y| \leq |x - y|$$

also prove that for any $x, y \geq 0$

$$|e^x - e^y| \geq |x - y|.$$