Math 2413 Memo Question Set Five:

1. Suppose f is a continuous function defined for all real numbers which has a maximum value of 5 and a minimum value of -7. Label each of the following as MUST, MIGHT, or NEVER true. (If might, show both cases and the restrictions) Explain.

   A The maximum value of $f(|x|)$ is 7.

   B The minimum value of $f(|x|)$ is 0.

2. Suppose f is a continuous function defined for all real numbers which has a maximum value of 5 and a minimum value of -7. Label each of the following as MUST, MIGHT, or NEVER true. (If might, show both cases and the restrictions) Explain.

   A The maximum value of $|f(x)|$ is 7.

   B The minimum value of $|f(x)|$ is 5.

3. Suppose f is a function for which $f'(x) > 0$ for $x \in \mathbb{R}$, and let $g(x) = f(f(x))$. Must g be increasing for all real numbers? Explain.

4. Suppose f is a function for which $f'(x) < 0$ for $x \in \mathbb{R}$, and let $g(x) = f(f(x))$. Must g be decreasing for all real numbers? Explain.

5. Determine if the statement MUST, MIGHT, or NEVER be true. Explain. (E) $f'(x) > 0$, $f''(x) > 0$ but $f(x) < 0$ for $x \in \mathbb{R}$

6. Determine if the statement MUST, MIGHT, or NEVER be true. Explain. (E) $f''(x) > 0$ but $f'(x) < 0$ for $x \in \mathbb{R}$

7. Determine if the statement MUST, MIGHT, or NEVER be true. Explain. (E) $f''(x) > 0$ but $f(x) < 0$ for $x \in \mathbb{R}$

8. Suppose for some number E that $f'(E) = f''(E) = 0$ but $f'''(E) > 0$. Does f have a relative maximum, relative minimum, inflection point, or none of the above at $x = E$? Explain. What about if $f'''(E) < 0$?

9. Suppose f is a function defined for all real numbers which has a maximum value of 5 and a minimum value of -7. Label each of the following as MUST, MIGHT, or NEVER true. Explain.

   A The maximum value of $f(|x|)$ is 7.

   B The minimum value of $f(|x|)$ is 0.

10. Suppose f is a function defined for all real numbers which has a maximum value of 5 and a minimum value of -7. Label each of the following as MUST, MIGHT, or NEVER true. Explain.

    A The maximum value of $|f(x)|$ is 7.

    B The minimum value of $|f(x)|$ is 5.