ATTENDANCE QUIZ (WEEK 9)

COLTON GRAINGER (MATH 1300)

Your name (print clearly in capital letters): ____

This is an **ungraded** quiz that will count for attendance; it is due by the end of recitation.

Definitions

Let f be a function and A a set of numbers contained in the domain of f. (If you like, you may assume A is an interval of real numbers, like (a, b) or $(-\infty, \infty)$ or $[a, b]$. However, these definitions hold for *any set* of numbers A in the domain of f.)

1. A point $x_{\max}$ in A is a **maximum point** for f on A if

$$f(x_{\max}) \geq f(x) \quad \text{for every } x \text{ in } A.$$

   i. The number $f(x_{\max})$ is called the **maximum value** of f on A.
   ii. We also say that f "has its maximum value on A at $x_{\max}$".

2. A particular number y_{above} is a **bound** for f on A if

$$y_{\text{above}} \geq |f(x)| \quad \text{for every } x \text{ in } A.$$

3. A point x_{local} in A is a **local maximum point** for f on A if:

   There is a positive number $\delta > 0$ such that x_{local} is a maximum point for f on the set

$$\{\text{points in } A \text{ whose distance to } x_{\text{local}} \text{ is less than } \delta\}.$$

Short answer

What part(s) of which definition(s) above should be modified to instead define a **minimum point** and the **minimum value** for a function f on A?

Your answer: ____

List five numbers, in decreasing order, that bound the function $\arctan\colon \mathbf{R} \to (-\frac{\pi}{2}, \frac{\pi}{2})$.

Your answer: ____

Date: 2019-03-14.

Suppose the function

$$f(x) := \begin{cases} -x^2 & \text{if } -1 < x < 1 \\ 0 & \text{if } x \leq -1 \text{ or } x \geq 1 \end{cases}$$

represents force (N) in the positive x-direction on the head of a pendulum when the pendulum is displaced by x (cm) from equilibrium. If there is a local maximum point for f on $\mathbf{R}$, find it; else, find a local minimum point for f on $\mathbf{R}$.

Your answer: ____

4. Suppose f and g are increasing functions from $\mathbf{R}$ to $\mathbf{R}$. (Recall that a function g is **increasing** on an interval if $g(a) < g(b)$ whenever a and b are two numbers in the interval with $a < b$.) Which of the following functions is *not* guaranteed to be an increasing function from $\mathbf{R}$ to $\mathbf{R}$?

   (A) $f + g$
   (B) $f \cdot g$
   (C) $f \circ g$
   (D) All of the above, i.e., none of them is guaranteed to be increasing.
   (E) None of the above, i.e., they are all guaranteed to be increasing.

Your answer: ____

References

As usual, question 4 is from Naik [1] and the definitions are from Spivak [2].

[1] V. Naik, "Math 152 Course Notes," 2012.

[2] M. Spivak, *Calculus*, 3rd ed. Publish or Perish, Inc., 1994.