CLASS QUIZ: OCTOBER 12: DERIVATIVES

MATH 152, SECTION 55 (VIPUL NAIK)

Your name (print clearly in capital letters): ____

Write your answer in the space provided. In the space below, you can explain your work if you want (this will not affect scoring). I may or may not get time to look at the work you have done, but it may help you recall how you arrived at a particular answer.

You are expected to take about one minute per question.

(1) (**) Suppose f is a differentiable function on $\mathbb{R}$. Which of the following implications is **false**? *Last year:* 0/14 *correct*
(A) If f is even, then f' is odd.
(B) If f is odd, then f' is even.
(C) If f' is even, then f is odd.
(D) If f' is odd, then f is even.
(E) None of the above, i.e., they are all true.

Your answer: ____________________________

(2) (*) A function f on $\mathbb{R}$ is said to satisfy the *intermediate value property* if, for any $a < b \in \mathbb{R}$, and any d between $f(a)$ and $f(b)$, there exists $c \in [a, b]$ such that $f(c) = d$. Which (one or more) of the following functions satisfies the intermediate value property? *Last year:* 7/14 *correct*
(A) $f(x) := \{ \begin{matrix} \sin(1/x), & x \neq 0 \\ 0, & x = 0 \end{matrix}$
(B) $f(x) := \{ \begin{matrix} 1, & x \text{ rational} \\ 0, & x \text{ irrational} \end{matrix}$
(C) $f(x) := \{ \begin{matrix} x, & x \text{ rational} \\ 0, & x \text{ irrational} \end{matrix}$
(D) All of the above
(E) None of the above

Your answer: ____________________________

PLEASE TURN OVER FOR THE THIRD AND FOURTH QUESTION.

(3) Which (one or more) of the following functions have a period of π? *Last year:* 12/14 *correct*

(A) $x \mapsto \sin^2 x$
(B) $x \mapsto |\sin x|$
(C) $x \mapsto \cos^2 x$
(D) $x \mapsto |\cos x|$
(E) All of the above

Your answer: ____________________________

(4) Suppose f is a function defined on all of $\mathbb{R}$ such that f' is a periodic function defined on all of $\mathbb{R}$. What can we conclude is **definitely true** about f? *Last year:* 8/14 *correct*

(A) f must be a linear function.
(B) f must be a periodic function.
(C) f can be expressed as the sum of a linear and a periodic function, but f need not be either linear or periodic.
(D) f can be expressed as the product of a linear and periodic function, but f need not be either linear or periodic.
(E) f can be expressed as a composite of a linear and a periodic function, but f need not be either linear or periodic.

Your answer: ____________________________