DERIVATIVES I (ATTENDANCE QUIZ)

COLTON GRAINGER (MATH 1300)

Print your **full name** and **three digit section number** in the top right corner, attempt the problems, and return this page to me. You have about 90 seconds per question. You are free to discuss these questions with others while making your attempt. (Note: this quiz was written by Vipul Naik [1].)

1. Consider the expression $x^2 + t^2 + xt$. What is the derivative of this with respect to x (with t assumed to be a constant)?

    (A) $2x + 2t + x + t$
    (B) $2x + 2t + 1$
    (C) $2x + 2t$
    (D) $2x + t + 1$
    (E) $2x + t$

2. Which of the following verbal statements is **not valid as a general rule**?

    (A) The derivative of the sum of two functions is the sum of the derivatives of the functions.
    (B) The derivative of the difference of two functions is the difference of the derivatives of the functions.
    (C) The derivative of a constant times a function is the same constant times the derivative of the function.
    (D) The derivative of the product of two functions is the product of the derivatives of the functions.
    (E) None of the above, i.e., they are all valid as general rules.

3. Which of the following statements is **definitely true** about the tangent line to the graph of an everywhere differentiable function f on $\mathbf{R}$ at the point $(a, f(a))$ (Here, "everywhere differentiable" means that the derivative of f is defined and finite for all $x \in \mathbf{R}$)?

    (A) The tangent line intersects the curve at precisely one point, namely $(a, f(a))$.
    (B) The tangent line intersects the x-axis.
    (C) The tangent line intersects the $f(x)$-axis (the y-axis).
    (D) Any line through $(a, f(a))$ other than the tangent line intersects the graph of f at at least one other point.
    (E) None of the above need be true.

4. For a function $f : (0, \infty) \to (0, \infty)$, denote by $f^{(k)}$ the kth derivative of f. Suppose $f(x) := x^r$ with domain $(0, \infty)$, and r a rational number. What is the **precise set of values** of r satisfying the following: there exist a positive integer k (dependent on r) for which $f^{(k)}$ is identically the zero function.

    (A) r should be an integer.
    (B) r should be a nonnegative integer.
    (C) r should be a positive integer.
    (D) r should be a nonnegative rational number.
    (E) r should be a positive rational number.

REFERENCES

[1] V. Naik, "Math 152 Course Notes" [Online]. Available: `https://vipulnaik.com/math-152/`