

**CLASS QUIZ: OCTOBER 10: 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) 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)? *Last year: 11/12 correct*
- (A)  $2x + 2t + x + t$
  - (B)  $2x + 2t + 1$
  - (C)  $2x + 2t$
  - (D)  $2x + t + 1$
  - (E)  $2x + t$

Your answer: \_\_\_\_\_

- (2) Which of the following verbal statements is **not valid as a general rule**? *Last year: 10/12 correct*
- (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.

Your answer: \_\_\_\_\_

**PLEASE TURN OVER FOR THE THIRD AND FOURTH QUESTION.**

- (3) (\*) Which of the following statements is **definitely true** about the tangent line to the graph of an everywhere differentiable function  $f$  on  $\mathbb{R}$  at the point  $(a, f(a))$  (Here, “everywhere differentiable” means that the derivative of  $f$  is defined and finite for all  $x \in \mathbb{R}$ )? *Last year: 6/12 correct*
- (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.

Your answer: \_\_\_\_\_

- (4) (\*) For a function  $f : (0, \infty) \rightarrow (0, \infty)$ , denote by  $f^{(k)}$  the  $k^{\text{th}}$  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. *Last year: 4/12 correct*
- (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.

Your answer: \_\_\_\_\_