MATH 251 (PHILLIPS) QUIZ 1, 9:00 am M 27 January 2025. 20 minutes; 20 points.

NAME: _____ Student id: _____

Standard exam instructions apply. In particular, no calculators, no communication devices, and no notes except as 3×5 file card, written on both sides. Also, all notation must be correct, with "=", "lim", etc. everywhere they are supposed to be, and nowhere they are not supposed to be. Write answers on this page. Use the back if necessary.

---

1. (6 points.) Let k be a constant. Find the derivative of the function $f(y) = \dfrac{2}{\sqrt[5]{y}} - 4ky^{-10} - \pi^{32}$. Show at least one intermediate step. This problem is not mostly about notation, but **notation counts.**

2. (6 points.) Find the derivative of the function $q(x) = x^5 - x^3 \cos(x)$. Show at least one intermediate step. This problem is not mostly about notation, but **notation counts.**

3. (8 points.) This problem is about using correct notation. Accordingly, almost all the credit is for correctness of notation.

Consider the problem of finding the exact value of $\lim\limits_{x \to -2} \dfrac{x^5 + 2x^4 + 3x + 6}{x + 2}$. The method is to factor the numerator and cancel one of the factors. The factors of the numerator are $x + 2$ and $x^4 + 3$.

Write out the calculation in full in correct notation which exhibits correctly the steps of the calculation. In particular, put "=" and "lim" everywhere they belong, and nowhere else. Start by writing $\lim\limits_{x \to -2} \dfrac{x^5 + 2x^4 + 3x + 6}{x + 2}$. Show at least the following steps: after factoring but before cancellation; after cancellation but before substituting $x = -2$; after substituting $x = -2$ but before possible simplification; and the simplified final result, if the result in the previous step can be simplified.