

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 a be a constant. Find the derivative of the function $g(t) = 3at^{10} - \frac{7}{\sqrt[4]{t}} + \pi^6$.

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 $w(x) = 31 - (x^3 - 2x) \sin(x)$. 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 $\lim_{x \rightarrow -3} \frac{x^3 + 3x^2 + 2x + 6}{x + 3}$. The method is to factor the numerator and cancel one of the factors. The factors of the numerator are $x + 3$ and $x^2 + 2$.

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 $\lim_{x \rightarrow -3} \frac{x^3 + 3x^2 + 2x + 6}{x + 3}$. Show at least the following steps: after factoring but before cancellation; after cancellation but before substituting $x = -3$; after substituting $x = -3$ but before possible simplification; the simplified final result, if the result in the previous step can be simplified.