Instructions: This quiz is closed books and closed notes. You may use calculators. Work that is erased or crossed out will not be graded.

1. (8 pts)
   (a) If \( f(x) = 2x^{113} + 13x^3 + x + 13^{13} \), find \( f'(x) \).

   (b) Find the derivative of \( f(t) = t^{-0.2} \).

   (c) If \( f(x) = (x^3 + 2)(4x - 3) \), find \( \frac{df}{dx} \) using the product rule.

   (d) Calculate \( \frac{d}{dx} \left( \frac{1}{\sqrt{x^3}} \right) \).

2. (2 pts) Suppose that the fraction of chickadee chicks that survive, \( P(N) \), as a function of the number \( N \) of eggs laid is given by

\[
P(N) = 1 - 0.05N.
\]

The total number of offspring is \( S(N) = NP(N) \). Find \( S'(N) \). Plot \( S'(N) \). What is the best strategy for this bird?

Extra Credit: “Whether water or air,” Dabiri says, “it all comes down to the same __________________.”