This is version 22 of the gateway exams that I prepared in Fall 2001.

Gateway Exam

MT-A142, Sections 4 and 5, Fall 2001  Name ________________________________

Turn in your answers with all of your work on the colored paper, but turn in this page also. I will return it with the graded exam. Wherever it is appropriate, you should multiply whole numbers, reduce fractions, collect like terms and apply laws of exponents. On this exam, you are NOT allowed to use calculators.

(1) Find \( f'(x) \) and \( f''(x) \) if \( f(x) = 5x^{-2} + \ln(23) - \pi x \).

(2) Find \( g'(x) \) if \( g(x) = x^3 e^{-2x} \sin(7x) \).

(3) Find \( \frac{dy}{dx} \) if \( y = \ln(x^4 + 5x + 38) \).

(4) Find \( \frac{dy}{dx} \) and simplify if \( y = \frac{5x - 1}{(3x^2 + 2)^3} \).

(5) Find \( \frac{dy}{dx} \) implicitly if \( x^3 = 4xy^3 - e^{-5y} \).

(6) Find \( h'(x) \) if \( h(x) = (\sec^{-1} x)^4 \).

(7) Find \( \frac{dx}{dt} \) if \( x = 3^t \).

(8) Find an antiderivative for \( f(x) \) if \( f(x) = \ln 5 + x^{-4} + 10x^2 \).

(9) Find an antiderivative for \( g(x) \) if \( g(x) = x^5 e^{x^6} \).

(10) Find an antiderivative for \( f(x) \) if \( f(x) = \sec^2(5x) \).