This is version 24 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 \( f(x) = \ln(11) + 8x^{\frac{3}{2}} - x^{-4} \).

(2) Find \( g'(x) \) if \( g(x) = x^3 \sec(5x) \).

(3) Find \( \frac{dy}{dx} \) if \( y = \ln(4 + 7 \sin x) \).

(4) Find \( \frac{dy}{dx} \) and **simplify** if \( y = \frac{3x - 5}{(2x - 3)^8} \).

(5) Find \( \frac{dy}{dx} \) implicitly if \( xy^4 - 3y^2 = x^5 \).

(6) Find \( h'(x) \) if \( h(x) = (\cos^{-1} x)^5 \).

(7) Find \( \frac{dx}{dt} \) if \( x = 5\sqrt{t} \).

(8) Find an **antiderivative** for \( f(x) \) if \( f(x) = x^{-3} + \sqrt[3]{4} + 25x^4 \).

(9) Find an **antiderivative** for \( g(x) \) if \( g(x) = \sin(16x) \).

(10) Find an **antiderivative** for \( f(x) \) if \( f(x) = \frac{x}{x^2 + 25} \).